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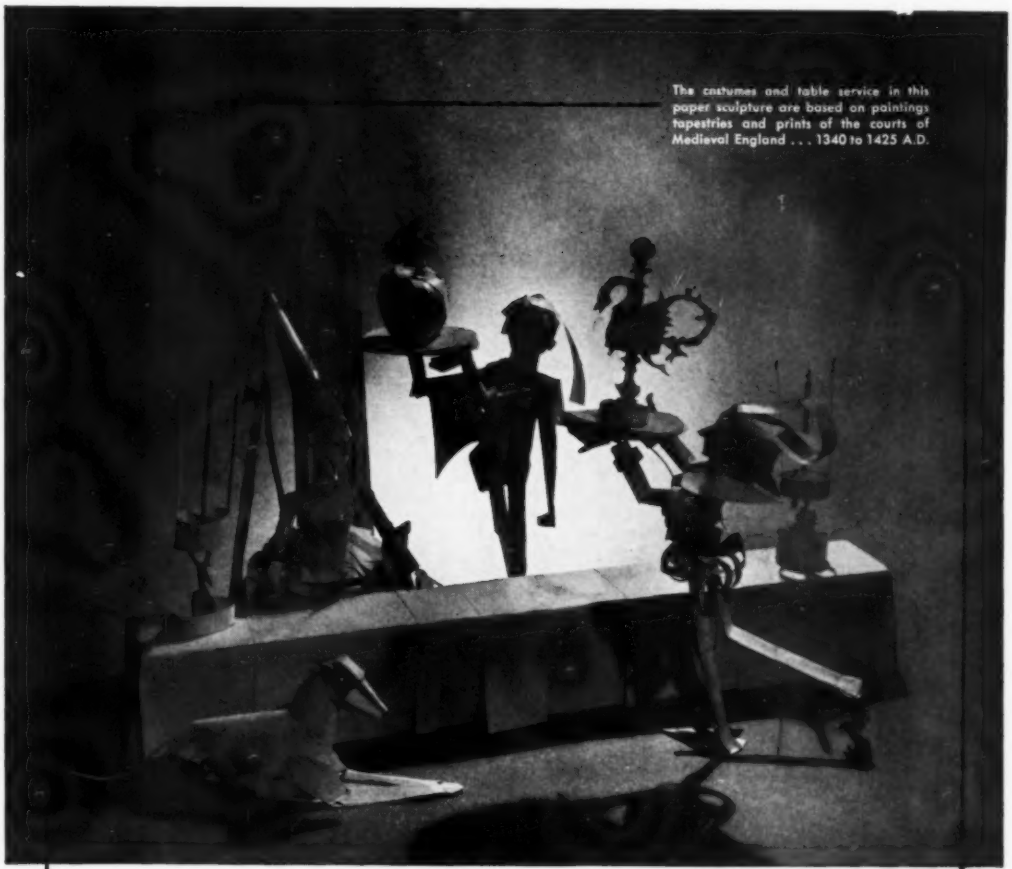
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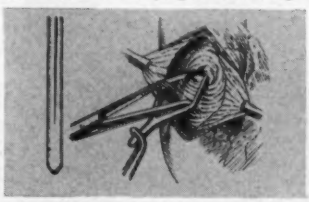

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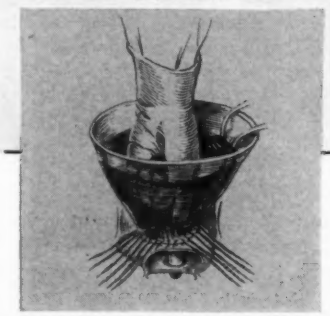

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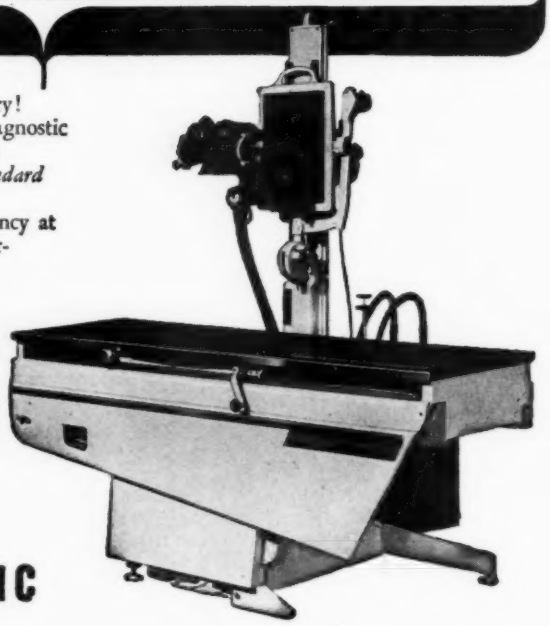

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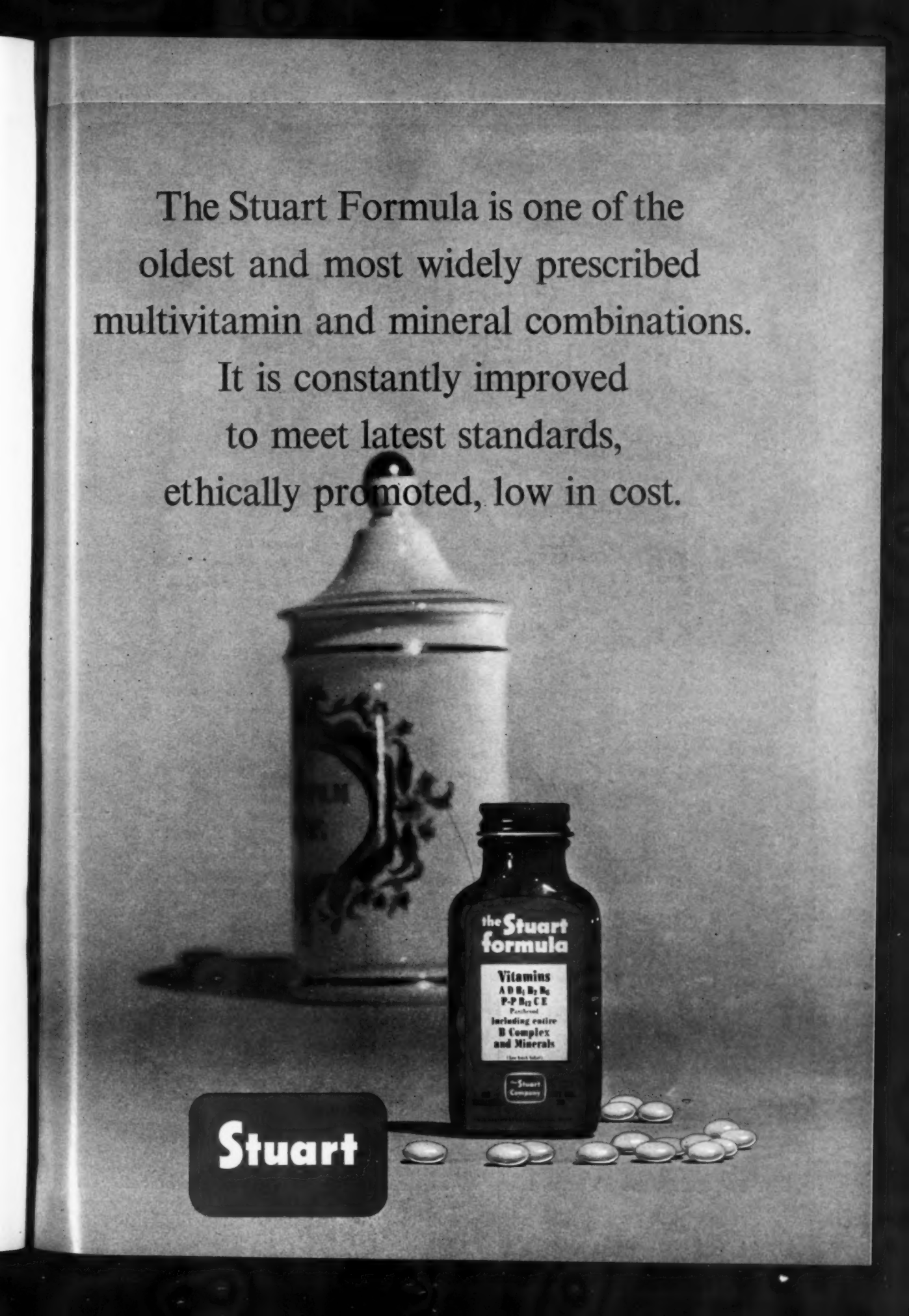
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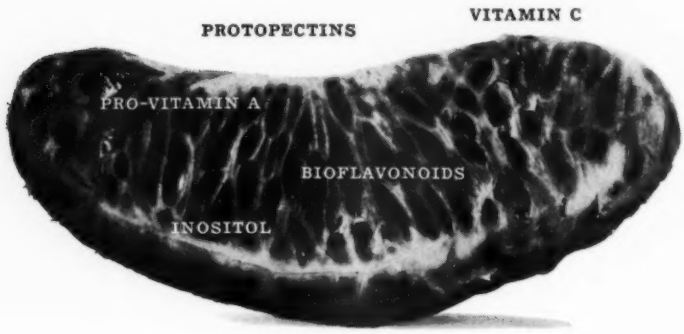

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These substances include carotene (which helps satisfy the vitamin A requirement), bioflavonoids, inositol (a lipotropic B vitamin), and the protopectins, which have a useful physiological effect as distinguished from a nutritional value.

These extra values in the whole orange make a significant contribution to a well-balanced diet. Doesn't it seem sound advice to say—"Include fresh oranges among the eating fruits you buy. Eat an orange a day."?

Sunkist Navels are generally regarded as the world's finest eating oranges. Rich in flavor, no seeds, and easy to peel.

SUNKIST GROWERS—LOS ANGELES 54, CALIFORNIA

Sunkist®

California-Arizona Navel Oranges

"THIOSULFIL"®
brand of sulfamethylthiadiazole

The safest and most effective sulfonamide yet presented for urinary tract infections

provides these advantages...

Potent bacteriostatic activity

Rapid transport to site of infection for early and effective urinary concentration

Rapid renal clearance

Minimum toxicity

Minimum risk of sensitization

No alkalinization required

No forcing of fluids needed

GREATER SOLUBILITY + LOWER ACETYLATION = GREATER SAFETY

Now available in two dosage forms for greater convenience

SUSPENSION

No. 914—0.25 Gm. per 5 cc.
Bottles of 4 and 16 fluidounces

TABLETS

No. 785—0.25 Gm. per tablet
Bottles of 100 and 1,000

5340

Detailed literature giving complete dosage schedules is available to physicians.

AYERST, McKENNA & HARRISON LIMITED • New York, N. Y. • Montreal, Canada

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A safe tranquilizer-antihypertensive

Serpasil T.M.

(RESERPINE CIBA)

A pure crystalline alkaloid of Rauwolfia serpentina

Serpasil, *a pure, crystalline, single alkaloid of* Rauwolfia serpentina, *produces* mild, gradual, sustained *lowering of blood pressure without undesired effects from unknown alkaloids of the whole root. Other advantages:*

- *Effective alone or in combination with other antihypertensive agents.*
- *Uniform potency.*
- *Predictable therapeutic results.*
- *No tolerance developed, or toxic effects reported; no contraindications; no serious side effects.*

Virtually every hypertensive patient may be treated with **Serpasil** *therapy. Prescribe this* safer *tranquilizer-antihypertensive now. Available at all prescription pharmacies.*

Serpasil *Tablets, 0.25 mg.–0.1 mg. Bottles of 100.*

Ciba *Summit, New Jersey*

R / 1937M

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BUILT INTO EVERY UNIT

GOMCO
EQUIPMENT

GOMCO THERMOTIC DRAINAGE PUMPS

• What is the price of reliability in equipment? When it means a unit ever-ready to do its important job month after month, year after year — a unit you can always count on — then its value to the clinic or hospital is beyond price.

Gomco units have gained this reputation through years of use. Gomco Thermotic Drainage Pumps are widely used in leading hospitals for their gentle, on-off suction so essential in post-operative drainage where delicate tissues must be protected. Automatic, they operate indefinitely without attention other than emptying the gallon suction bottle. A trap bottle protects against overflow damage in the Gomco No. 765 model, while the Gomco No. 765-A has the added protection of Gomco's exclusive Aerovent Overflow Valve. There are no moving parts to wear out or make any noise. Ask your supplier about these investments in gently, completely reliable suction service.

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a selective alkaloidal extract (the alseroxylon fraction) of Rauwolfia serpentina, freed from the inert dross of the whole root

Brings New Efficacy...
Greater Safety...
Lessened Side Actions...
A New Sense of Well-Being...

to the treatment of Hypertension

NOTE THESE ADVANTAGES

- Moderate, gradual lowering of blood pressure—a slow, smooth hypotensive effect...
- Rapid relief of associated symptoms usually before objective changes are noted...
- Gentle sedation (without somnolence)...
- Mild bradycardia, appreciated especially where tachycardia has led to anxiety...
- Virtually no side effects...
- Dosage not critical—increased dosage (beyond usual effective) produces neither excessive drop in tension nor severe side actions...
- No known contraindications...

For Every Type and Grade

A Riker Rauwiloid Preparation

In Mild and Labile Hypertension...

RAUWILOID

Rauwiloid—for the first time—provides effective therapy.

Symptoms rapidly disappear—are replaced by a new sense of tranquility and well-being.

Gradually the blood pressure is moderately lowered, the pulse is mildly slowed.

One dose per day, initially 2 tablets, usually adequate; after full effect is reached, 1 tablet per day frequently suffices as maintenance dose. Tolerance does not develop.

Since action is apparently central, the dangers of postural hypotension are avoided.

In Moderate to Severe Hypertension...

RAUWILOID+ VERILOID®

Rauwiloid combines well with other, faster-acting and more potent hypotensive agents, adding its own characteristic effects to theirs.

Since the combined drugs appear to potentiate each other, smaller dosages of each usually suffice.

Each tablet of Rauwiloid+Veriloid presents 1 mg. of Rauwiloid and 3 mg. of Veriloid. Initial dose, 1 tablet t.i.d., best after meals. Effective dose varies with individuals from 3 to 8 tablets per day.

At this dosage level side actions to Veriloid are greatly reduced. Relief of symptoms is produced rapidly, blood pressure is lowered, tranquility ensues.

The combination of Rauwiloid+Veriloid, because of lessened side actions and freedom from postural hypotension, merits being first choice in moderate and severe hypertension.

In Intractable or Rapidly Advancing Hypertension...

RAUWILOID+ HEXAMETHONIUM

Each scored tablet provides 1 mg. of Rauwiloid and 250 mg. of hexamethonium chloride dihydrate. The combination offers distinct advantages.

Dosage requirement for hexamethonium is markedly reduced by Rauwiloid. Hence side actions are greatly lessened, in severity as well as incidence.

The reduced blood pressure achieved appears more stable. Subjective improvement is striking. The patient experiences a welcome tranquility, appetite improves, and tachycardia is overcome.

Contraindicated only when hexamethonium itself cannot be used.

Physicians are invited to send for a new brochure on the treatment of "Severe, Intractable Hypertension."

RIKER LABORATORIES, INC. 8480 BEVERLY BLVD. • LOS ANGELES 48, CALIF.

The Place of Enriched Bread in the Reducing Diet

It is universally acknowledged that the only effective means of weight reduction is restriction of caloric intake. Furthermore, it is acknowledged that no single food can be branded as fattening, that the solution to the problem is sensible limitation of the amounts of all foods eaten.

That enriched bread has a place in the modern reducing diet is evidenced by its inclusion in many weight reduction programs recommended by authorities in the fields of metabolism and internal medicine. Such a diet has recently been included in a pamphlet published by one of the nationwide organizations concerned with national health and the increasing problem of obesity.

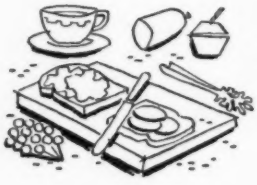
This diet, a conventional reducing diet providing 1,200 to 1,400 calories per day, allows a balanced variety of basic foods including bread. Note the sample menu.

Enriched bread is far more than just a carbohydrate food, as is often the mistaken concept. Moreover, in itself, it is not a "fattening food," since only the calorically excessive diet can induce increase in body weight. Three slices of enriched bread provide only 189 calories, yet this amount makes a worthwhile contribution of biologically applicable protein, B group vitamins, and valuable minerals including iron and calcium. Of even greater importance to the person dieting is the gustatory attractiveness which bread lends to the meal.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

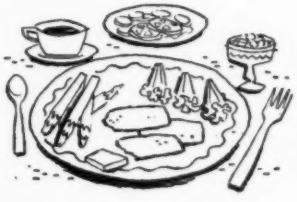
BREAKFAST

4 ounces tomato juice
1 boiled egg — 1 slice of toast
1 teaspoon butter — Coffee with milk



LUNCH

Liverwurst sandwich
(1 ounce meat, mustard, lettuce)
Celery — Small bunch grapes
1 cup of milk



DINNER

Roast chicken (3 slices, or 3 ounces)
Broccoli — 1 teaspoon butter
Asparagus — Fresh fruit cup
Tomato-cucumber salad, vinegar — Coffee or tea with milk

BEDTIME

Orange or ½ banana — ½ cup milk

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The Journal of the American Osteopathic Association says in a recent review:

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Conclusive evidence

of the effectiveness and low toxicity

of Furadantin

in treating bacterial urinary tract infections

is provided in its recent

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The N.N.R. monograph on Furadantin states:

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Nitrofurantoin.—Furadantin (Eaton).—

Actions and Uses.—Nitrofurantoin, a nitrofuran derivative, exhibits a wide spectrum of antibacterial activity against both gram-positive and gram-negative micro-organisms. It is bacteriostatic and may be bactericidal to the majority of strains of Escherichia coli, Micrococcus (Staphylococcus) pyogenes albus and aureus, Streptococcus pyogenes, Aerobacter aerogenes, and Paracolobactrum species. The drug is less effective against Proteus vulgaris, Pseudomonas aeruginosa, Alcaligenes faecalis, and Corynebacterium species; many strains of these organisms may be resistant to it. However, bacterial resistance to other anti-infective agents is not usually accompanied by increase in resistance of the organisms to nitrofurantoin. The drug does not inhibit fungi or viruses.

Nitrofurantoin is useful by oral administration for the treatment of bacterial infections of the urinary tract and is indicated in pyelonephritis, pyelitis, and cystitis caused by bacteria sensitive to the drug. It is not intended to replace surgery when mechanical obstruction or stasis is present. Following oral administration, approximately 40% is excreted unchanged in the urine. The remainder is apparently catabolized by various body tissues into inactive, brownish compounds that may tint the urine. Only negligible amounts of the drug are recovered from the feces. Urinary excretion is sufficiently rapid to require administration of the drug at four to six hour intervals to maintain antibacterial concentration. The low oral dosage necessary to maintain an effective urinary concentration is not associated with detectable blood levels. The high solubility of nitrofurantoin, even in acid urine, and the low dosage required diminish the likelihood of crystalluria.

Nitrofurantoin has a low toxicity. With oral administration it occasionally produces nausea and emesis; however, these reactions may be obviated by slight reduction in dosage. An occasional case of sensitization has been noted, consisting of a diffuse erythematous maculopapular eruption of the skin. This has been readily controlled by discontinuing administration of the drug. Animal studies, using large doses administered over a prolonged period, have revealed a decrease in the maturation of spermatozoa, but this effect is reversible following discontinuance of the drug. Until more is known concerning its long-term effects, blood cell studies should be made during therapy. Frequent or prolonged treatment is not advised until the drug has received more widespread study. It is otherwise contraindicated in the presence of anuria, oliguria, or severe renal damage.

Dosage.—Nitrofurantoin is administered orally in an average total daily dosage of 5 to 8 mg. per kilogram (2.2 to 3.6 mg. per pound) of body weight. One-fourth of this amount is administered four times daily—with each meal and with food at bedtime to prevent or minimize nausea. For refractory infections such as Proteus and Pseudomonas species, total daily dosage may be increased to a maximum of 10 mg. per kilogram (4.5 mg. per pound) of body weight. If nausea is severe, the dosage may be reduced. Medication should be continued for at least three days after sterility of the urine is achieved.

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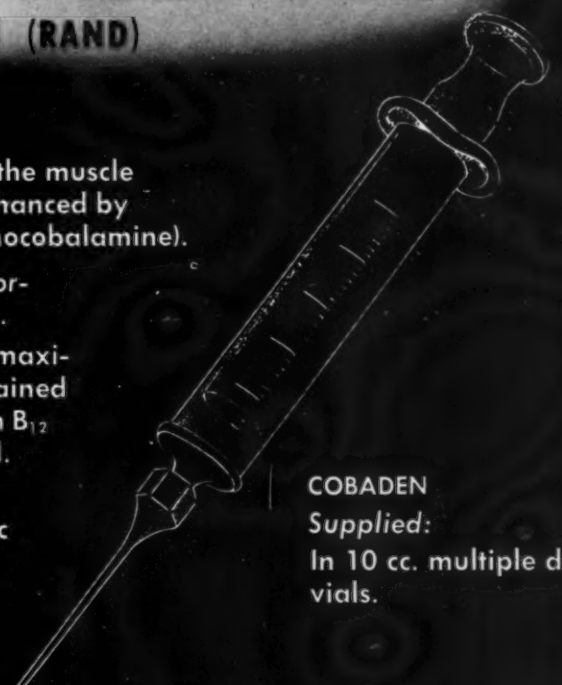

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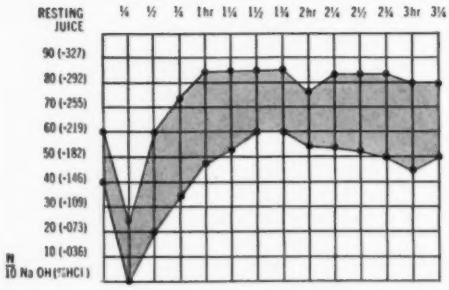
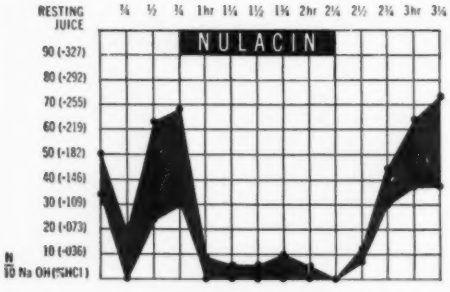
Nulacin



GASTRIC ANALYSIS. Superimposed gruel fractional test-meal curves of five patients with peptic ulcer.



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In active ulcer flare-ups, two to three tablets per hour, starting one-half to one hour after each meal, are prescribed. During quiescent periods, the suggested dosage is two tablets between meals.

Indicated in active and quiescent peptic ulcer, gastritis, gastric hyperacidity. Available through all pharmacies in tubes of 25 tablets.

1. Douthwaite, A. H., and Shaw, A. B.: The Control of Gastric Acidity, Brit. M. J. 2:180 (July 26) 1952.

2. Douthwaite, A. H.: Medical Treatment of Peptic Ulcer, M. Press 227:195 (Feb. 27) 1952.

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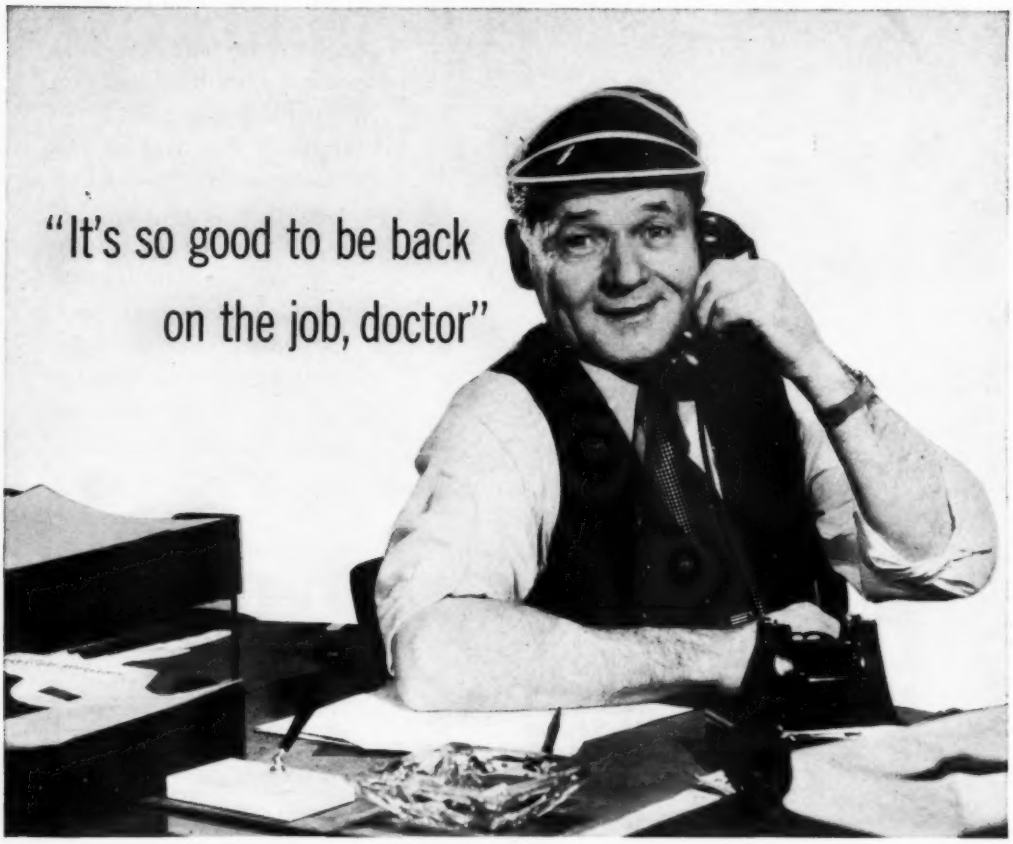

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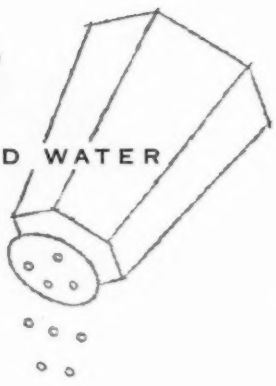

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The Osteopathic Approach to Fluid and Electrolyte Therapy*

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I. INTRODUCTION

This discussion will be concerned primarily with problems of fluid and electrolyte therapy in cardiac edema. In using any form of drug therapy an osteopathic physician should remember that drugs are chemical agents which can do nothing more than modify physiologic processes. Drugs in general are rather drastic agents which, when used judiciously, can help the body restore physiologic homeostasis but cannot substitute for homeostatic mechanisms, or endow cells with new functions.

Osteopathic medicine embraces the concept that pharmacotherapeutics is only one of many possible forms of therapy. Since drugs act by modifying physiologic processes, it is obvious that all drugs are potentially toxic agents and that no drug can be used with impunity in all disease entities or for long periods. The old rule, "Primum non nocere (First of all do no harm)," is still an excellent one for osteopathic physicians to follow.

The importance of the osteopathic concept of drug therapy has recently become apparent to many enlightened old-school physicians although they may not be aware of the osteopathic origin of this concept. An example of such osteopathic thinking in nonosteopathic circles is represented by a recent excellent book entitled "Side Effects of Drugs."[1] The preface to this book closely parallels osteopathic philosophy.

A rational osteopathic approach to fluid and electrolyte therapy in cardiac edema requires the realization of the following principles:

1. An understanding of the major physiologic disturbances which are responsible for the development of congestive heart failure and consequent edema.

2. A knowledge of the normal electrolyte patterns of the body fluid compartments, as a basis for recognition of the abnormal.

3. An appreciation of the mechanisms underlying fluid and electrolyte homeostasis and of the importance of these mechanisms for the maintenance of normal cardiovascular and renal function.

4. An appreciation of the fact that diuretics, particularly mercurials, cannot be administered with impunity to every edematous patient for long periods.

II. PHYSIOLOGIC DISTURBANCES RESPONSIBLE FOR THE DEVELOPMENT OF CARDIAC EDEMA

The beginning of wisdom is the admission of ignorance. The basic causes of myocardial diseases, and for that matter of most of the cardiovascular-renal diseases, have not yet been discovered, a situation which is true for perhaps all degenerative diseases. The elucidation of the fundamental mechanisms underlying these disturbances will come about as a result of much more intensive and systematic research in the physiologic and clinical sciences.

A. Fluid Homeostasis.—

For purposes of study the body may be divided into three major fluid compartments as illustrated in Figure 1. These divisions are:

1. The intravascular compartment which is represented by blood plasma and which amounts to about 5 per cent of total body weight. An average man weighing about 70 Kg. would, therefore, have about 3.5 liters of plasma.

2. The interstitial fluid compartment which represents about 15 per cent of body weight and amounts, therefore, to about 10.5 liters in an average man.

3. The intracellular fluid compartment, which is the largest fluid depot, amounts to about 45 per cent of body weight or a total of about 31.5 liters in an average man. The intravascular and interstitial fluid divisions are jointly referred to as the extracellular fluid compartment and amount to about 20 per cent of total body weight or about 14 liters in a 70 Kg. man.

Normally the total body water and the amount in each of the fluid compartments are maintained at amazingly constant levels in spite of a continuous interchange between the three compartments and in spite of wide fluctuations in fluid intake. This constancy has been referred to as fluid homeostasis.

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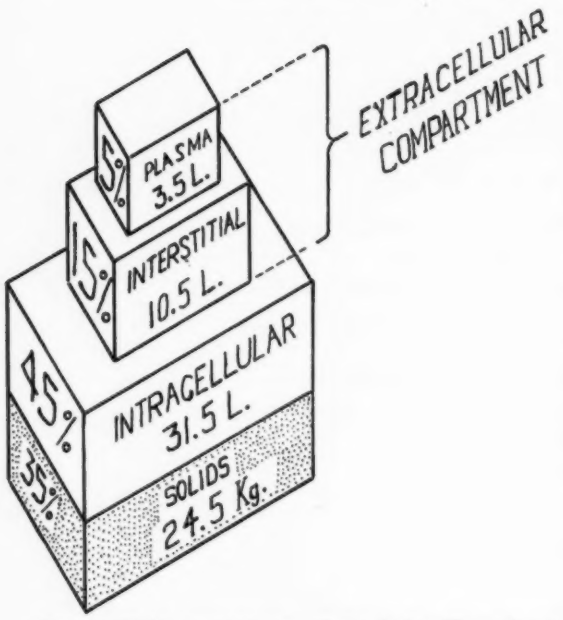

Fig. 1. Fluid compartments of the body. The volumes are calculated for an average 70 Kg. man.

In edema, as we shall see later, there is probably a shift of fluid from the intravascular to the extravascular compartment followed by an increase in total body fluid. This increase in total body water is probably shared by the extracellular and intracellular compartments.

The constancy of the fluid compartments is maintained primarily by means of two opposing forces: the hydrostatic pressure in the blood capillaries (maintained by the work of the heart) which tends to filter fluid out of the vascular compartment into the tissue spaces, and the osmotic pressure exerted by the plasma proteins (referred to as the colloid osmotic pressure) which tends to draw fluid into the capillaries.

As is well known, the capillaries, the only part of the circulatory system where fluid exchange takes place, are freely permeable to water, salts, and most of the other blood plasma components with the exception of the plasma proteins and the formed elements. The average capillary blood pressure in man is about 30 mm. Hg. Were this the only force involved, most of the plasma fluid would be filtered out of the capillaries into the interstitial spaces. This filtration process is opposed by the colloid osmotic pressure exerted by the plasma proteins which tends to draw fluid into the capillaries from the tissue spaces, since tissue fluid normally has a negligible protein content.

Actually, as can be seen in Figure 2, there is a hydrostatic pressure gradient in the capillaries, starting with a pressure of about 50 mm. Hg. at the arteriolar part of the capillary and decreasing to a value of 10 mm. Hg. or less at the venous part of the capillary. The colloid osmotic pressure of normal human plasma is, on the average, 25 mm. Hg.

In the arteriolar part of the capillary the hydrostatic pressure ($P_c = 40$) exceeds the colloid osmotic pressure (25) and fluid, therefore, leaves the capillary and enters the tissue spaces. On the venous side of the capillary, on the other hand, the colloid osmotic pressure (25) is greater than the capillary pressure (10) and fluid is attracted from the interstitial spaces into the capillaries. Each capillary thus exhibits the operation of a fluid circuit, with the fluid leaving the capillary on the arteriolar side and entering it on the venous side. This fluid exchange has therefore been referred to as the fluid circuit theory, originally proposed by Starling,[2] the famous British physiologist.

Actually the situation is somewhat more complicated, since there are at least two more factors involved. One factor is tissue tension (P_t) which tends to oppose filtration from the capillaries. The other factor is the colloid osmotic pressure exerted by the small quantity of protein found in the tissue fluids (COP_{tf}) which would tend to draw fluid from the capillaries into the tissue spaces.

This relationship can be represented by simple mathematical equations. At the arteriolar end of the capillary, the filtration pressure, or the force which would tend to filter fluid across the capillary membrane, could be represented as follows:

$$P_f = (P_c - P_t) - (COP_{pl} - COP_{tf}) \quad (1)$$

In man, the average value of P_c (capillary pressure) = 40 mm. Hg.; P_t (tissue pressure) = 6 mm. Hg.; COP_{pl} (colloid osmotic pressure of plasma protein) = 25 mm. Hg.; COP_{tf} (colloid osmotic pressure of tissue fluid) = 1 mm. Hg. Substituting these values in equation (1) for the *arteriolar* end of the capillary we get:

$$P_f = (40 - 6) - (25 - 1) = +10 \quad (2)$$

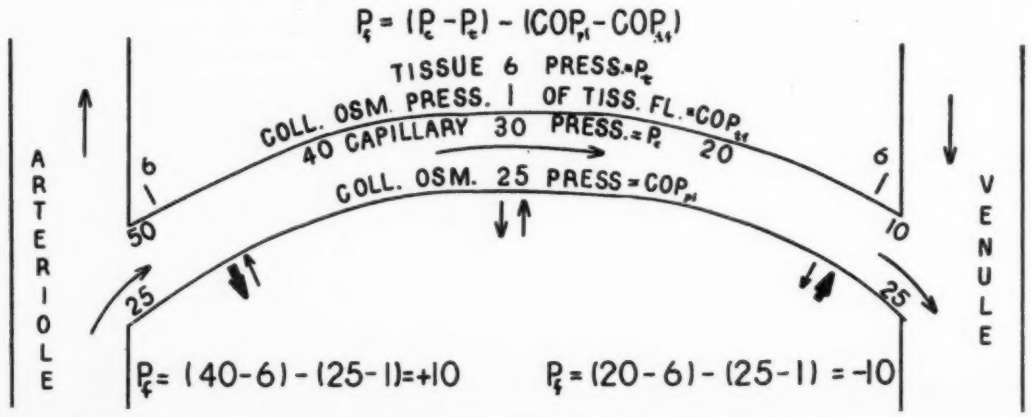
$P_f = (P_c - P_t) - (COP_{pl} - COP_{tf})$
TISSUE 6 PRESS. = P_t
COLL. OSM. PRESS. OF TISS. FL. = COP_{tf} 1
40 CAPILLARY 30 PRESS. = P_c 20
COLL. OSM. 25 PRESS = COP_{pl}
ARTERIOLE
VENULE
6
50
10
25
25
$P_f = (40-6) - (25-1) = +10$
$P_f = (20-6) - (25-1) = -10$

Fig. 2. Fluid exchange across a capillary in normal man, according to Starling's fluid circuit theory.

On the *venous* end of the capillary these values would be:

$$P_f = (20 - 6) - (25 - 1) = -10 \quad (3)$$

In other words, just as much fluid enters the capillary on its venous side as leaves on the arteriolar end. Under conditions of good health the *net over-all* filtration pressure across the *entire length* of a capillary can be represented as:

$$P_f = (30 - 6) - (25 - 1) = 0 \quad (4)$$

In other words, there is no net gain or loss of fluid from the capillary. Whenever the value is greater than zero, accumulation of extravascular fluid or edema takes place.

As we shall see later, edema represents not just a shift of fluid from the vascular to the extravascular compartment but a net gain of fluid by the body and, in many cases, fluid and electrolyte shifts between the extracellular and the cellular compartments. However, the initial stage in edema formation probably takes place as a shift of fluid from the capillaries into the tissue spaces.

B. Electrolyte Homeostasis.—

Normally there are mechanisms in the body not only for the preservation of fluid homeostatis but also for the maintenance of a constant concentration of various electrolytes, such as sodium, potassium, chloride, bicarbonate, et cetera, in the body fluid compartments.

As is indicated in Figure 3, the electrolyte components of the blood plasma and of the interstitial fluid are quite similar qualitatively and quantitatively. These two compartments are usually grouped together and referred to as the extracellular fluid compartment.

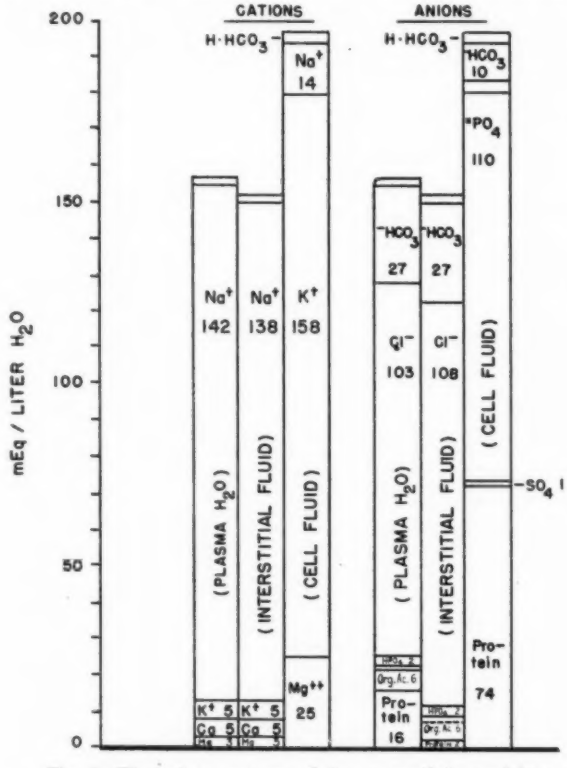

Fig. 3. Electrolyte patterns of the extracellular and intracellular fluid compartments. Note that the chief cation in extracellular fluid (plasma and interstitial fluid) is sodium, while within the cells the main cation is potassium. The predominant anion in the extracellular compartment is chloride, while within the cells the anions are represented primarily by phosphate and protein.

TABLE I—ELECTROLYTE PATTERNS OF THE EXTRACELLULAR AND INTRACELLULAR FLUID COMPARTMENTS

Ions	Extracellular	Intracellular
Cations	mEq/L	mEq/L
Sodium	142	14
Potassium	5	158
Calcium	5	—
Magnesium	3	25
Total	155	197
Anions		
Chloride	103	2
Phosphate	2	110
Bicarbonate	27	10
Sulfate	1	1
Protein	16	74
Organic Acid	6	—
Total	155	197

The reason for this similarity in electrolyte composition is the fact that the capillary endothelium is freely permeable to all electrolytes (except for the plasma proteins which behave as anions under the acid-base conditions of the body). These electrolytes, therefore, distribute themselves equally throughout the extracellular fluid. The slight differences are due to a phenomenon referred to as the Donnan equilibrium, occasioned by the presence of the plasma proteins to which the capillaries are impermeable. This is of comparatively minor importance and need not be discussed at this point.

The intracellular fluid, on the other hand, is quite distinct from the extracellular fluid. This is due to the fact that cell membranes, unlike the capillary endothelium, are not freely permeable to salts. Active metabolic mechanisms are largely responsible for the maintenance of the intracellular concentrations of various ions.

As is shown in Figure 3 and Table I, the chief cation (or positive ion) in the extracellular fluid is sodium. Within the cells the major cation is potassium.

It is a remarkable and, thus far, little understood fact that, though potassium is found in high concentrations within almost all cells in all known species of animal or plant life, this same ion is highly toxic when found in comparatively small excess amounts outside the cells. The toxicity of potassium in concentrations above normal in the extracellular fluid is so great that is is extremely dangerous to administer this ion via the intravenous route. Why this is so remains one of the most challenging unsolved physiologic problems.

Again referring to Figure 3 and Table I, it is obvious that the major anion (or negatively charged ion) in the extracellular fluid is chloride (the bicarbonate ion being next in line), while within the cells the chief anionic components are represented by phosphate and the proteins.

The comparative impermeability of cells to salts leads to a number of important therapeutic conclusions, one of these being the response of the body to either sodium depletion or excess. When there is a decrease in the extracellular sodium concentration, there is a relative increase in the concentration of water in the

extracellular compartment or a decrease in the osmotic pressure. Since the intracellular cations cannot move into the extracellular spaces to re-establish osmotic equilibrium, the excess extracellular water moves into the cells. Extracellular sodium loss (such as occurs in the low salt syndrome) therefore leads to cellular hydration. This may in part be responsible for the disastrous effects of this syndrome if not rapidly corrected.

On the other hand, intravenous infusion of hypertonic sodium salts will increase the osmotic pressure of the extracellular fluid compartment and therefore will withdraw water from the cells, that is, lead to cellular dehydration. This may partly explain the beneficial effects produced by the intravenous administration of hypertonic sodium chloride to patients suffering from hyponatremia.

C. Fluid and Electrolyte Disturbances in Cardiac Edema.—

In a normal man at rest the cardiac output equals about 5 liters per minute. During muscular activity more blood is returned to the heart per unit time. This increased inflow of blood stretches the myocardial fibers. As was demonstrated by Starling[3] many years ago the heart contracts more forcefully the more the muscle fibers are stretched. This principle, often referred to as the law of the heart or Starling's law, operates only up to a certain point of stretching the myocardial fibers. As more blood enters the heart and the fibers are further stretched, a point is finally reached (Fig. 4) when further stretching reduces the force of contraction. This in turn leads to incomplete emptying of the heart chambers, so that blood tends to accumulate at the venous end of the heart, further stretching the muscle fibers and decreasing the force of contraction, thus leading to congestive heart failure.

In other words, congestive heart failure develops when the myocardial fibers have been stretched beyond the normal physiologic limits of operation of Starling's law. The job of the physician then is to return the operation of the heart to the point where it is within the limits of this law. As we shall see later, digitalis represents one important tool for that purpose.

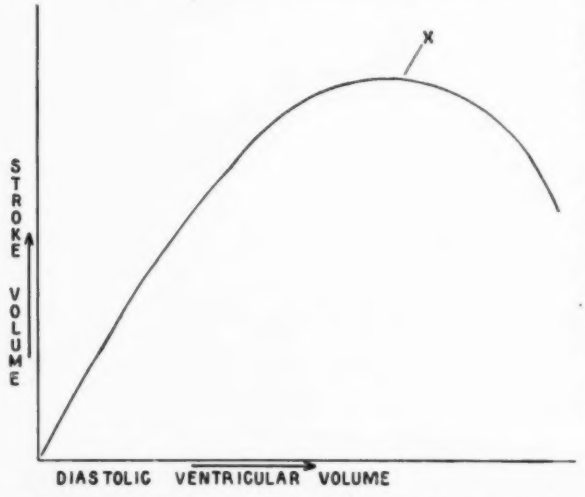

Fig. 4. Starling's law of the heart. The heart contracts more forcefully the more the fibers are stretched by the inflow of blood. However, stretching the fibers beyond the point x reduces the force of contraction, thus leading to congestive heart failure.

In a person in good health, the myocardial fibers probably never stretch beyond the operation of the law of the heart because the individual will usually stop the physical activity long before this level is reached. In a cardiac patient, however, this limit may be reached with moderate activity, and in severe cases it is reached following the slightest exertion.

In patients with so-called secondary heart disease (for example, resulting from thyrotoxicosis or severe anemia) the resting demands on the heart are so great that the muscle fibers are stretched up to the brink of this physiologic precipice so that the slightest exertion stretches the fibers beyond the limits of operation of Starling's law and congestive heart failure results. In such cases congestive heart failure may occur in the face of a high cardiac output.

It appears, therefore, that congestive heart failure occurs whenever the demands on cardiac activity exceed the cardiac reserve. It follows that the first step in therapy of congestive heart failure should be the readjustment of activity to cardiac reserve.

The accumulation of blood on the venous side of the heart naturally tends to increase venous pressure. This in turn tends to increase the capillary pressure, so that the net filtration pressure in the capillaries now exceeds zero and fluid leaves the blood plasma and enters the interstitial spaces.

This is the beginning of edema formation, but in itself this would not become evidenced as pitting clinical edema. The increased venous pressure is transmitted also to the renal veins. Experimental evidence indicates that increased renal venous pressure leads to a reduction in renal blood flow and glomerular filtration rate[4] as well as to decreased excretion of sodium and water. This in turn would lead to accumulation of fluid in the blood plasma and extracellular space, finally leading to frank edema and a net gain of fluid by the body.

Renal dysfunction and edema accumulation are further aggravated by the fact that the inability of the heart to meet the demands for blood by the peripheral tissues leads to reflex peripheral vasoconstriction in order to conserve an adequate blood supply to the vital centers, particularly the brain. The renal vessels participate in this compensatory peripheral vasoconstriction, again leading to decreased renal blood flow and decreased glomerular filtration.[5] This in turn leads to decreased excretion of sodium and water, again leading to fluid accumulation and therefore to edema.

This factor of increased venous pressure forms the basis of the so-called "backward failure" theory of cardiac edema, whereas the effects of a decreased cardiac output on renal vasoconstriction have been used to develop the "forward failure" school of thought. Actually, it appears that both factors are involved. At any rate, the development of "schools of thought" tends to contribute more heat than light on this problem; and what we need is more light.

The probable sequence of events leading to the production of cardiac edema may be summarized as follows:

1. Imbalance between peripheral needs for blood and cardiac reserve.

2. Increased diastolic volume until the limits of operation of Starling's law of the heart are exceeded, leading to:

3. Progressively decreased myocardial efficiency. This leads to:

4. Venous engorgement and to increased venous and capillary pressures and, therefore, increased capillary transudation and hemoconcentration.

5. Increased renal vein pressure leads to decreased salt and water excretion and therefore tends to produce edema.

6. Decreased cardiac output leads to peripheral vasoconstriction, in which the renal circulation participates.

7. Decreased renal blood flow and glomerular filtration again leads to decreased excretion of salt and water and contributes to the accumulation of edema fluid.

8. Accumulation of edema fluid interferes with the proper nutrition of and removal of waste products from renal and cardiac tissues, thus creating a vicious cycle. The task of the physician is to break this cycle.

Whatever the initial cause of edema may be, once it occurs it is imperative that the physician institute measures which will tend to remove this excess fluid. This is essential in order to permit the rapid exchange of fluid and nutrients between the cells and the blood capillaries.

This exchange takes place by virtue of diffusion. As indicated in Table II, the rate of diffusion of a substance varies as the square of the distance. For small distances, diffusion is a very rapid process. However, as the distance increases, diffusion becomes a slow process, so that a molecule of sugar which will cross a thickness of 1 micron (one thousandth of a millimeter) in a fraction of a second may require an hour to travel a distance of 1 millimeter.

TABLE II—DIFFUSION OF SUCROSE†

Distance	Time
1 mm.	1 hour
10 mm.	100 hours
1 meter	115 years
10 meters	11,500 years
1 μ (0.001 mm.)	3σ (0.003 sec.)
0.1 μ	0.03σ (0.00003 sec.)

†The time required to reach a certain distance varies as the square of the distance. For explanation see text.

Normally the layer of interstitial fluid which separates the body cells from the capillary endothelium is very thin indeed, so that the exchange of fluid, nutrients, and waste products takes place rapidly. As the edema fluid layer becomes thicker, diffusion becomes extremely ineffective, thus creating starvation and auto-intoxication conditions for the body cells, including the cardiac and renal cells. This tends to impair further the functions of the heart and kidneys and thus will intensify the edema formation, creating a vicious cycle. The physician must try to break this cycle in order to re-establish the normal physiologic homeostatic mechanisms.

III. THERAPEUTIC MEASURES

A. Measures Designed to Adjust Bodily Activity to Cardiac Reserve.—Since congestive heart failure represents an imbalance between the tissue requirements for blood and the ability of the heart to deliver this supply, the logical thing for the physician to do is try to adjust the physical activities of the patient to the cardiac reserve. The degree of limitation on activity should be adjusted in each individual case to a point compatible with the particular cardiac reserve of the patient. It must be remembered that in most cases confinement in bed in the horizontal position is unnecessary and physiologically unsound, since such a position would tend to shift the edema fluid from the periphery to the pulmonary region and thus initiate or intensify dyspnea. In most cases resting in a sitting position is the most beneficial position.

B. Restoration of Cardiac Function (to bring it within the limits of operation of Starling's law).—Congestive heart failure represents a condition in which the diastolic volume exceeds the limits of operation of Starling's law of the heart, so that further stretching of the myocardial fibers leads to less effective contractions. In other words, as Figure 4 indicates, the heart operates on the right side of the Starling law curve.

The task of the physician then is to shift this curve to the left and bring the heart muscle back within the limits of operation of Starling's law. Rest represents one step in that direction. Digitalis has the specific property of increasing the force of contraction and decreasing the diastolic volume, thus shifting the Starling curve to the left and permitting the cardiac muscle to operate within the confines of Starling's law.[6] Digitalis actually improves the mechanical efficiency of the myocardium, so that the muscle performs more work with less oxygen consumption. The cardiac output is increased so that blood flow to the peripheral regions is improved. With the improvement in the renal circulation and the decrease in renal venous pressure more salt and water are excreted and edema fluid is thus eliminated.

It is important that the patient be properly digitalized. Overdigitalization obviously may aggravate the disease. Underdigitalization, however, is no less serious, since it will obviously fail to improve cardiac function.

In fact, some cardiologists[7] advise that digitalis should be administered in dosages which produce the first symptoms of toxicity, namely nausea and vomiting. The dosage should then be reduced until the optimal effects on cardiac activity are obtained.

C. Treatment of Pulmonary Edema and Dyspnea.—Pulmonary edema, by interposing an increased layer of fluid across the capillary exchange surfaces, interferes with the process of oxygenation of the blood. Arterial blood therefore will carry less oxygen to the tissues, thus further embarrassing all the body cells including those of the heart and kidneys.

Pulmonary edema increases the rigidity of pulmonary tissues. This naturally increases the mechanical effort needed to produce normal ventilation. Decreased expansibility of the lungs gives rise to increased reflex stimuli to the respiratory center, thus leading to dyspnea. A decreased supply of oxygen to the tissues leads to the accumulation of carbon dioxide and lactic acid which in turn increases the stimulation of the respiratory center and aggravates the dyspneic condition.

The patient can be made more comfortable by the administration of central nervous system depressants such as morphine. This comfort, however, is gained at the expense of decreased pulmonary ventilation (by depressing the respiratory center). Such therapy is a typical example of purely symptomatic treatment; while temporarily relieving the discomfort of the patient it actually tends to aggravate the underlying causes of the symptoms.

On the basis of physiologic considerations rational osteopathic therapy would be represented by measures which would tend to relieve the anoxia and improve the gaseous exchange in the lungs. The anoxic condi-

tion is best combatted by the administration of high concentrations of oxygen, preferably under moderate positive pressure.

Atropine in rather high dosages (0.5-2.0 mg.) has been advocated for the purpose of decreasing bronchial and pulmonary secretions, but this procedure has not yet had a widespread clinical trial.

One of the most aggravating aspects of pulmonary edema is the transformation of the edema fluid into a tenacious froth. Alveolar capillary damage leads to the escape of proteins. Exaggerated respiratory movements acting on a protein-containing fluid tend to produce a voluminous and persistent foam which so increases the thickness of the fluid layer that gaseous exchange is greatly interfered with.

Rational therapy for this condition involves the use of antifoaming agents. Extensive trials in experimental animals demonstrated that ethyl alcohol inhalation served this purpose very well.[8] Subsequent clinical trials[9-11] confirmed the usefulness of this procedure in patients. The best way of administering the alcohol is by placing 40 per cent alcohol in the humidifying container during the administration of oxygen when an oxygen mask is used. Higher concentrations of alcohol are indicated when a nasal catheter is used for oxygen administration.

D. Dietary Management.—

Edema fluid tends to mask the progressive emaciation and malnutrition resulting from anorexia and poor assimilation in patients with congestive heart failure. This tends to impair further the metabolic activities of the body cells including the myocardial and renal tissues. It is a problem that is worthy of more attention than many physicians give it, preoccupied as they are with purifying the diet of the last vestige of sodium.

In reality too rigid salt restriction in the diet makes the food so unpalatable and difficult to prepare that this dietary regime contributes no little to the emaciation of the patient. Prolonged malnutrition may, among other things, lead to the development of vitamin and essential amino acid deficiencies which further aggravate the condition of the patient.

Edema fluid is chiefly an increase in the volume of the extracellular fluid compartment. Since this consists primarily of an approximately isotonic solution of sodium chloride (Figs. 3, 5), it is reasonable to restrict the intake of these ions, since this procedure limits the number of available bricks from which the edema edifice is built.

However, an osteopathic physician should not in this, or in any other pharmacotherapeutic procedures, indulge in what often is referred to as "heroic" medicine. Actually this type of therapy is more heroic for the patient than for the physician. Salt restriction should be gradual, utilizing perhaps some salt substitutes and making sure that the salt restriction does not develop into food restriction. The average daily salt intake of Americans equals about 10 grams a day. Restriction to about 5 grams a day in many cases may suffice; seldom should it be less than from 1 to 2 grams a day. As we shall see later, excessive and prolonged salt restriction coupled with mercurial diuretic therapy may produce the very serious and often fatal low salt syndrome.

E. Diuretic Therapy.—

It is a fashionable practice among many physicians to administer diuretics, chiefly mercurials, at the first signs of cardiac edema simultaneously with or even preceding digitalization. The promiscuous administration of mercurial diuretics to every patient with cardiac edema is not only an unjustifiable procedure but may actually do a great deal of harm. It can safely be said that a good 50 per cent of patients with cardiac edema do not need mercurial diuretics and can be managed with correct digitalization and reasonable sodium intake restriction.

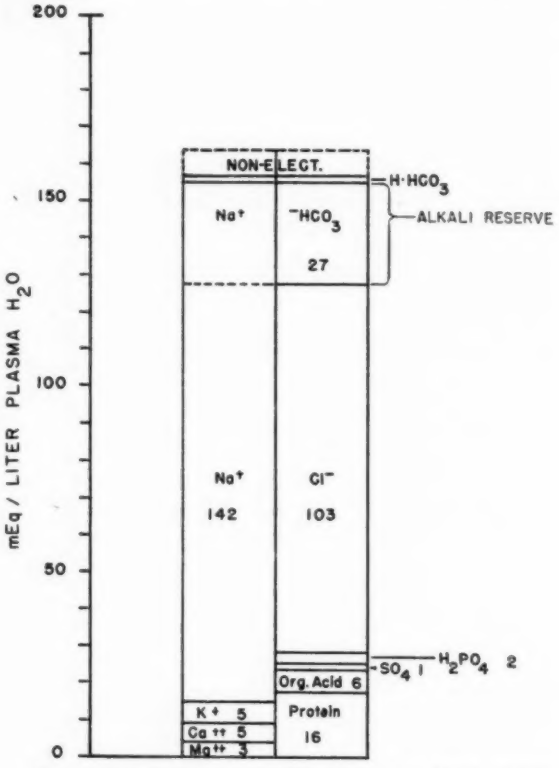

Fig. 5. Electrolyte composition of human blood plasma.

Some of the most competent clinicians are beginning to recognize this dangerous abuse of mercurials as can be seen in the following quotation from George E. Burch:[12]

> Most patients with chronic congestive heart failure do not need diuretics. The current tendency to use mercurial diuretics as soon as congestive heart failure is suspected is not only unnecessary but may even produce fatalities. Diuretics should be reserved for those circumstances in which the foregoing measures fail to produce desired effects.

While it cannot be denied that in some patients mercurial diuretics may be very useful therapeutic adjuncts and may even be lifesaving, it must nevertheless be remembered that these agents are not as benign as many physicians apparently think.

The rationale of therapy with mercurial diuretics rests on the following facts:

1. In cardiac edema, for the reasons mentioned above, the kidney excretes less sodium and water, so that an isotonic solution of sodium salts (chiefly chloride) accumulates in the body, thus giving rise to edema.

2. This accumulation of excess sodium is at least in part due to excessive reabsorption of sodium ions by the renal tubules, as explained previously.

3. This renal sodium reabsorption is an active process accomplished by specific enzyme systems residing in the cells of the renal tubules.

4. Mercurial diuretics have the property of poisoning these enzyme systems so that renal sodium reabsorption is inhibited and more sodium appears in the urine. Water is attracted to the sodium by osmotic means, thus leading to a diuretic response.

Now, with our present therapeutic knowledge, the administration of mercurial diuretics in some patients may represent the only means of eliminating the edema fluid and may therefore represent a lifesaving measure.

One must not lose sight, however, of the fact that mercurial diuretics are enzyme poisons. Evidence indicates that mercurials inhibit a rather widespread group of intracellular enzymes containing the sulfhydryl (SH) group.

The sulfhydryl-containing enzymes play an important role in various cellular oxidative processes and are found not only in the cells of the renal tubules but in all other tissues, including the heart. Mercurials can poison these enzyme systems wherever they are found. It is obvious therefore that mercurial diuretics are not the type of substance which should be used indiscriminately and for long periods. Toxic reactions are unavoidable and are simply extensions of their therapeutic effects which are based on poisoning enzymes.

Many toxic side effects have been reported for the mercurials.[1] We shall list here some of the major side reactions:

1. Low Salt Syndrome:[13,14] This syndrome is characterized by the following signs and symptoms:

a. Hyponatremia, which may or may not be accompanied by hypochloremia.

b. Development of refractoriness to doses of mercurial diuretics to which the patient previously responded well.

c. Apathy and lethargy.

d. Anorexia, nausea, vomiting.

e. Abdominal and muscle cramps.

f. Fatigue and psychotic disturbances.

g. Oliguria, anuria, azotemia.

h. Coma, death.

This disturbance is due chiefly to a depletion of sodium (or sodium and chloride) and is a result of overzealous treatment with mercurial diuretics and low salt diets. In fact excessive administration of mercurials and/or too rigid dietary salt restriction will inevitably produce this syndrome, since the body will be depleted of the minimal amount of sodium needed for the maintenance of a normal blood volume and normal renal function.

The syndrome is especially likely to develop in the summer under conditions of excessive sweating, since the patient will lose some sodium in the sweat. Concomitant administration of cation-exchange resins will make even more likely the development of this disturbance, since the resins represent another means of removing sodium from the body.

If not early recognized and treated this syndrome is fatal. Treatment consists of slow intravenous administration of hypertonic sodium chloride (about 5 per cent). The quantity to be administered is best calculated on the basis of a plasma sodium determination. The low salt syndrome should be suspected whenever a patient fails to respond to a dose of mercurial diuretic to which he has responded before. A plasma sodium determination will clinch the diagnosis.

2. Ventricular Arrhythmias: These are particularly likely to occur as a result of intravenous administration of mercurials, a procedure which should be reserved only for extreme emergencies.

3. Cardiovascular Collapse: This may be produced by a too intense diuresis and consequent severe decrease in blood volume.

4. Symptoms of Overdigitalization: This condition again may follow too intense diuresis. Rapid elimination of fluid may lead to a sudden increase in the concentration of digitalis, thus producing symptoms of digitalis toxicity. Avoidance of heroic doses of mercurials will prevent the development of these symptoms.

5. Allergic Reactions: Recently a number of clinical reports appeared in regard to development of sensitization to mercurial diuretics.[15] The appearance of even mild allergic reactions to a mercurial should be a warning sign.

One should mention here the recent introduction of Neohydrin, an oral mercurial diuretic which appears to show clinical promise.[16] It is unfortunate that the trade name may be misleading, since it does not tell the physician that it is still a mercurial diuretic and that caution should be observed in its administration.

In summary, we wish to emphasize that a large proportion of patients with cardiac edema can be managed satisfactorily with a regime of rest, proper digitalization, reasonable restriction in salt intake, and last but not least appropriate osteopathic manipulation.

When edema persists in spite of the above-mentioned measures, nonmercurial diuretics should be tried

TABLE III—CLASSIFICATION OF DIURETICS

I. Osmotic Diuretics	II. Xanthines
A. Colloids	Theophylline
Plasma proteins	Aminophylline, USP
Acacia	Glucophylline, NNR
Gelatin	Theophylline sodium glycinate, NNR
Dextrans	Theobromine
PVP (Polyvinyl pyrrolidone	Caffeine
B. Crystalloids	III. Organic Mercurials
1. Nonelectrolytes	
Sucrose	Mercurophylline, USP (Mercuzanthin, NNR) (intramuscular, intravenous, oral)
Mannitol	
Urea	
Glucose	Mersalyl and Theophylline, USP (Salyrgan-Theophylline, NNR) (intramuscular, intravenous, oral)
2. Electrolytes	
a. Neutral Salts	
Sodium chloride	
Potassium chloride	
Potassium nitrate	Meralluride, USP (Mercuhydrin, NNR) (intramuscular, intravenous, oral with ascorbic acid)
b. Acidifying Salts	
Ammonium nitrate	
Ammonium chloride	
Calcium chloride	
c. Alkalinizing Salts	Mercaptomerin sodium, NNR (Thiomerin sodium) (subcutaneous or intramuscular)
Sodium lactate	
Sodium acetate	
Sodium succinate	
Sodium bicarbonate	
Potassium acetate	
d. Water	Neohydrin (oral)

first. Table III gives a brief summary of various types of diuretics. Many of these have not been sufficiently investigated either in the laboratory or in the clinic. We have initiated a long-range program of research in our laboratories in order to prepare a more rational and safer basis for diuretic therapy.

Xanthine diuretics, such as theophylline, certainly deserve a trial. Recent evidence suggests that higher dosages than usually administered (about 1 gram a day) are required to produce diuresis.[17] Unfortunately such dosages produce severe gastrointestinal disturbances in most patients. Several attempts have been made to prevent such gastrointestinal irritation by combining the theophylline with buffer salts,[18] particularly with aluminum hydroxide gel.[17] The preliminary clinical trials appear to be promising.

For many years it has been taught that acidifying salts (like ammonium chloride) have diuretic properties whereas alkalinizing salts (such as sodium lactate or bicarbonate) will aggravate edema. These assertions have no physiologic basis and lack experimental or careful clinical verification.

Extensive experimental evidence[19-21] and preliminary clinical trials[22] in our laboratories have demonstrated that intravenous administration of alkalinizing salts can produce marked diuresis in normal and edematous animals and in patients with cardiac and nephrotic edema. More extensive experimentation is being planned along these lines.

The limitations of this paper will not permit a discussion of the mechanisms of diuretic action of these salts. For that matter a great many aspects of this problem still remain to be investigated. In general it appears that any attempt to shift the reaction of the body fluids either in the acid or in the alkaline direction will initiate renal mechanisms designed to excrete the excess acid or excess base, as the case may be. Water is then attracted into the renal tubules by means of osmotic forces, and diuresis takes place.

Our own studies as well as those from other laboratories suggest that renal mechanisms regulating electrolyte concentrations are much more sensitive and persistent than the mechanisms responsible for the regulation of *fluid volume*. In other words, the kidney readily permits expansion of the extracellular fluid compartment as long as the electrolyte concentrations remain the same. Even in normal man temporary edema can be produced by administering large quantities of isotonic sodium chloride. On the other hand administration of water (which dilutes the body electrolytes) or of hypertonic sodium chloride (which increases the concentration of sodium and chloride) leads to rapid diuresis. If, in addition to this, one also disturbs the reaction of the body fluids (by means of acidifying or alkalinizing salts), the kidney tends to excrete these salts even more rapidly and the diuresis is more intense. This was demonstrated in our laboratory in extensive experiments on normal and edematous animals.[20] We have not had an opportunity thus far to study carefully on patients the comparative diuretic effects of neutral and alkalinizing salts.

It should be mentioned here that whenever large quantities of edema fluid are removed by diuresis, significant quantities of potassium will be lost in addition to sodium and chloride. It is good practice therefore to make sure that the patient ingests daily some fluids containing potassium. Fruit juice and meat broth are excellent potassium sources.

F. Cation Exchange Resins.—

Cation exchange resins are polyvalent negatively charged ions which can bind reversibly various cations, including sodium ions. For clinical purposes they are prepared in such a manner that they bind hydrogen ions. When these resins are ingested and enter the small intestine the hydrogen ions are exchanged for the sodium in the intestinal and pancreatic juices and in the ingested food. The sodium ions thus adsorbed on the resins are removed with the feces. Sodium is thus eliminated from the body.

Unfortunately sodium is not the only ion these resins remove. They can remove just as well any of the positively charged ions, such as potassium, calcium, and many other cations, including the trace elements. Some resins come charged with potassium in order to counteract potential hypopotassemia. Calcium is also administered to prevent excess calcium loss.

Since these resins leave in the body hydrogen ions in exchange for the sodium, acidosis will tend to develop. In addition, many patients tend to develop constipation or diarrhea, abdominal cramps, anorexia, and vomiting while using these resins.

Finally the excessive use of these resins plus mercurial diuretics will hasten the development of hyponatremia and the resulting low salt syndrome, particularly during the summer.

These resins therefore may be useful adjuncts, but again care must be exercised in their administration. Periodic sodium, potassium, and calcium determinations will serve to prevent these specific ion deficiencies.

SUMMARY

The osteopathic approach to fluid and electrolyte therapy in cardiac edema is based on physiologic considerations of the nature of cardiac edema and can be represented by the following consecutive steps:

1. Adjustment of bodily activity to cardiac reserve, that is, institution of appropriate rest measures.
2. Proper digitalization in order to shift the activity of the myocardium back to within the limits of operation of Starling's law of the heart.
3. Treatment of pulmonary edema and dyspnea by oxygen administration and use of antifoaming agents. Use morphine or other central nervous system depressants only as a last resort, since they would tend to aggravate hypoxia.
4. Moderate salt restriction. Enough salt should be allowed that the diet does not become unmanageable or unpalatable so as to avoid malnutrition and the low salt syndrome.
5. Diuretic therapy only after the previous measures have proved to be inadequate. When diuretics are indicated, the less toxic xanthine diuretics such as theophylline are tried first. Mercurial diuretics are reserved for the patient who fails to respond to the other measures; even they should be used sparingly and with caution. Development of refractoriness to a mercurial diuretic may be a warning of an impending low salt syndrome. The mercurial should then be withdrawn immediately and salt therapy instituted.
6. Cation exchange resins. These agents may be useful adjuncts in some patients but must be used with caution, particularly during hot weather.

Above all, give the homeostatic physiologic mechanisms a chance; do not overtreat.

316 S. Cottage Grove

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Coronary Occlusion in Pregnancy and Youth

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The syndrome of acute coronary occlusion has been recognized as a clinical entity since 1912,[1] when Herrick presented the first concise picture substantiated by electrocardiographic findings. During the ensuing years much has been learned regarding etiology, diagnosis, and prognosis of this serious cardiac problem.

During recent years newer concepts of the mechanism of coronary occlusion have been postulated and, as a result of better statistical studies, it is fairly universally agreed that the prognosis is far better than was originally considered.[2] Anticoagulants and other important therapeutic contributions have materially decreased the mortality and morbidity. Refinements in diagnosis, particularly a better understanding of electrocardiography, have resulted in more accurate diagnoses.

Although the classic syndrome is fairly easily recognized, many physicians are still prone to overlook the more bizarre symptoms frequently associated with this condition. There are many atypical symptoms which often direct the physician's attention to other organs of the body; it is still not unusual to find a patient with coronary occlusion subjected to x-ray studies of the stomach and intestinal tract. More routine use of the electrocardiogram should prevent erroneous diagnoses and direct the physician's attention toward the heart. Immediate recognition of the problem and rapid application of therapy are important factors in prognosis.

During recent years there have been many reports in the literature of acute coronary occlusion in younger patients.[3-7] Studies made of sudden deaths of unknown cause in soldiers during the last war showed that many of these young men had died of acute coronary occlusion.[8,9]

Coronary thrombosis has even been reported in infants during the first year of life.[10,11] While these cases are extremely rare, they nevertheless must be considered in all individuals whose death is sudden and unexplainable. Regardless of age, any patient presenting symptoms of acute epigastric or chest pain must have coronary occlusion ruled out in the differential diagnosis.

In a recent publication[12] it was noted by the authors that no reference to acute myocardial infarction during pregnancy could be found in standard textbooks. A search of current literature indicated that myocardial infarction during pregnancy is an extremely rare phenomenon. The several cases reported occurred during the early phase of the first trimester of pregnancy.[1,12] Infarction of the myocardium during the last two trimesters of pregnancy is extremely rare and no reference to it can be found in standard textbooks.

The purpose of this article is to present two cases of coronary occlusion, confirmed by serial electrocardiographic studies, in young people who were treated at the Osteopathic Hospital in Kansas City.

CASE HISTORIES

CASE 1. A 24-year-old acutely ill housewife was admitted to the Osteopathic Hospital on the evening of June 5, 1951. Her chief complaints were pain in the "pit of the stomach" and over the heart and a tingling sensation of the fingers of the left hand with aching of the left shoulder. She recalled that, following her evening meal, she experienced sudden pain in the epigastrium with radiation to the precordial region. This was followed by nausea and vomiting and she "broke out in a cold clammy sweat." The pain radiated to her left arm and shoulder, and a tingling sensation developed in the fingers of her left hand. Immediately following the acute onset of pain she became nauseated and vomited on three successive occasions. She also became incontinent. While working in the garden at

home on the day prior to admission, she became dizzy for a few moments. Following the onset of the acute pain the dizziness recurred. Although the chest pain subsided the severe distress in the pit of the stomach persisted. Her husband notified the family physician who advised immediate hospitalization to rule out an acute abdominal emergency.

The patient volunteered the additional information that she had experienced pain in the epigastric region at various intervals during previous months, but not of very great severity. Intermittent attacks of nausea and vomiting unassociated with pain were attributed to pregnancy.

Inventory by Systems.—There were no significant weight changes prior to the attack. Special senses: Spontaneous nosebleeds of several minutes' duration occurring prior to regular menstrual periods. Gastrointestinal: Appetite good, occasional belching following fatty meals, occasional constipation. Cardiorespiratory: Intermittent chest pain following effort. Genitourinary: Polyuria and nocturia during recent months, believed to be due to pregnancy. Endocrines: Last menstrual period January 25, 1951. During April, however, she had slight menstrual bleeding for approximately 3 weeks and was, therefore, somewhat surprised to learn that she was pregnant. This was her seventh pregnancy—there were three living children; she had had one stillbirth and two miscarriages. She had been married 7 years. Previous health good. Usual childhood diseases; at age 12, "growing pains" were experienced but she had not been told that she had rheumatic fever. Venereal diseases denied. Family history: Mother and father died of "heart failure" at age 54 and 44 respectively.

Physical Examination.—Blood pressure on admission 86/56; temperature 97 F.; pulse 80; height 5 feet 3 inches; weight 120 pounds. Skin cold and clammy; anxious facies. Fine moist rales were heard at the bases of both lung fields with bronchovesicular breathing throughout the remainder of the lung fields. Point of maximum impulse was in fifth interspace in the midclavicular line. No murmurs; rhythm regular. Abdomen free of scars. Tenderness noted in epigastric region and in right and left upper quadrants. Pelvic examination revealed a purplish hue to the vaginal mucosa. Uterus was enlarged, consistent with a pregnancy of 5 to 6 months' duration. Neurologic examination essentially negative.

Laboratory Findings.—Urinalysis: (June 5) color, amber; character, cloudy; reaction, 5.5; specific gravity, 1.022; albumin, trace; sugar, 3 plus; acetone, positive; diacetic acid, positive; microscopic: leukocytes, occasional; erythrocytes, negative; epithelial cells, few squamous; casts, negative; bacteria, present; crystals, amorphous urates; (June 6) color, amber; character, clear; reaction, 6.0; specific gravity, 1.024; albumin, 1 plus; sugar, 2 plus; acetone, positive; diacetic acid, positive; microscopic: leukocytes, 4-6 per high power field; erythrocytes, negative; epithelial cells, present; casts, occasional granular; bacteria, present; crystals, amorphous urates; (June 7) color, amber; character, clear; reaction, 6.5; specific gravity, 1.030; albumin, negative; sugar, 4 plus; acetone, positive; diacetic acid, negative; microscopic: leukocytes, 1-2 per high power field; erythrocytes, occasional; epithelial cells, few squamous; casts, negative; bacteria, present; crystals, negative; (June 9) color, green-yellow; character, slightly cloudy; reaction, 7.0; specific gravity, 1.006; albumin, negative; sugar, negative; acetone, negative; diacetic acid, negative; microscopic: leukocytes, occasional; erythrocytes, negative; epithelial cells, many; casts, negative; bacteria, present; crystals, negative; (June 10) color, yellow; character, clear; reaction, 7.5; specific gravity, 1.007; albumin, negative; sugar, negative; acetone, negative; diacetic acid, negative; microscopic: leukocytes, occasional; erythrocytes, negative; epithelial cells, great many; casts, negative; bacteria, negative; crystals, amorphous urates.

Sedimentation rate studies: On admission 31.5 mm. fall in 1 hour; June 9, 30 mm.; June 11, 32 mm.; June 12, 30 mm.; June 13, 28 mm.; June 14, 27.5 mm. Serology: Kahn, negative. Blood chlorides: 490 mg. per 100 cc. of whole blood as sodium chloride (83.8 mEq. of chloride). Cephalin flocculation test: 24- and 48-hour-readings negative. Serum amylase: (June 6) 108 mg. glucose per 100 cc. serum; (June 7) 65 mg. per 100 cc. Prothrombin time (June 6) 23 seconds (74 per cent of normal). Nonprotein nitrogen (June 6) 29 mg. per 100 cc. Urea nitrogen (June 6) 12 mg. per 100 cc. Sugar (June 7) 111 mg. per 100 cc. Cholesterol (June 16) 320 mg. per 100 cc.

Blood counts: (June 5) erythrocytes, 3,700,000 per cu. mm.; leukocytes, 15,050 per cu. mm.; hemoglobin, 12.35 gm. per cent (80 per cent); color index, 1.07; clotting time, 7 minutes; differential white count: stab cells, 8 per cent; segmented polymorphonuclears, 65 per cent; lymphocytes, 27 per cent; (June 6) erythrocytes, 3,180,000; leukocytes, 13,150; hemoglobin, 10.55 gm. (68 per cent); color index, 1.09; differential white count: stab cells, 7; segmented polymorphonuclears, 81; lymphocytes, 9; monocytes, 3; (June 9) erythrocytes, 3,390,000; leukocytes, 10,000; hemoglobin, 10.55 gm. (68 per cent); color index, 1.03; differential white count: stab cells, 3; segmented polymorphonuclears, 73; lymphocytes, 20; monocytes, 1; eosinophils, 3; (June 10) erythrocytes, 3,390,000; leukocytes, 7,150; hemoglobin 12.0 gm. (77 per cent); color index, 1.05; differential white count: stab cells, 2; segmented polymorphonuclears, 72; lymphocytes, 21; monocytes, 4; eosinophils, 1.

Summary of Electrocardiographic Reports (Figure 1).—June 6: Abnormal record suggests recent posterior wall infarction of the myocardium; serial records are recommended to confirm this impression. June 7: The progressive changes of a recent posterior wall myocardial infarction are noted. June 8: The changes are characteristic of a recent posterior wall infarction with progression. June 9: Progressive changes of the myocardial infarction pattern are noted. The T Waves in leads II and III and AVF show progressive inversion, with large Q waves present. June 10: This record continues to show the characteristic changes of the myocardial infarction pattern as reported in the previous records. June 13: The T waves are progressively inverted in leads II, III, and AVF with progressively larger Q waves. The T waves in leads V2, V3, and V4 show progressive changes characteristic of a recent posterior wall infarction.

Radiographic Summaries.—June 5: There is radiographic evidence of a moderate amount of dilatation of the stomach as demonstrated by gas shadow. The

remaining portion of the abdominal viscera shows no evidence of gross pathology, nor is there gross pathology involving the pulmonary structures. June 6: The pulmonary structures fail to show evidence of gross pathology. There is evidence of what is believed to be a single pregnancy in the second trimester.

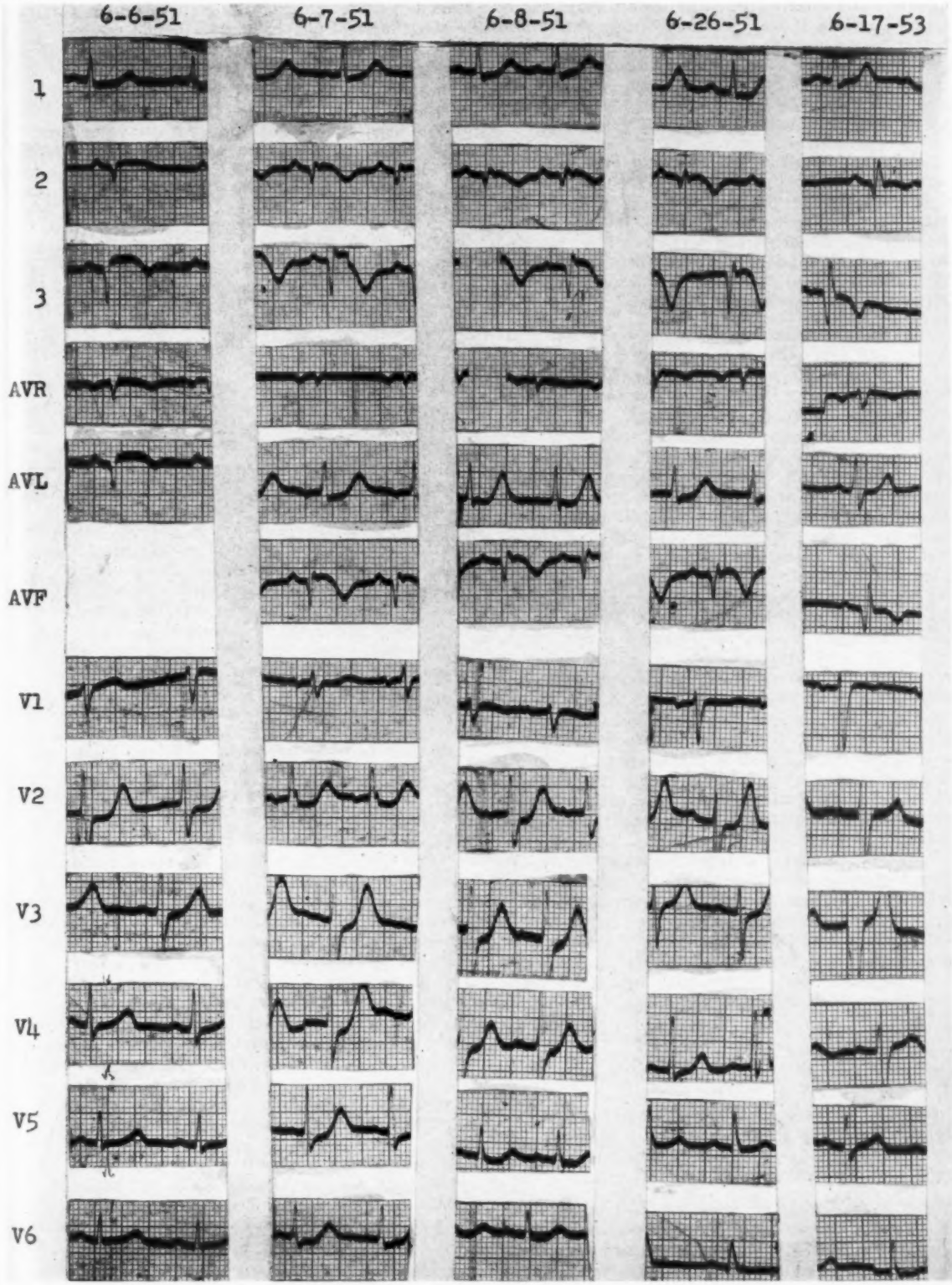

Fig. 1. Serial electrocardiograms of a 24-year-old woman, in the third trimester of pregnancy, with acute posterior wall myocardial infarction. The last tracing represents residual changes 2 years after the original episode.

Course and Management.—When the patient was first admitted to the hospital her blood pressure was 86/56. The immediate treatment was symptomatic and supportive and directed primarily toward management of shock. Since it was not immediately determined whether the problem was an acute abdominal emergency or acute coronary occlusion she was given oxygen for peripheral cyanosis, and her bed was placed in a modified Trendelenburg position. Blankets and hot-water bottles were used for supportive measures.

Because of an original suspicion of a ruptured viscus, a flat x-ray of the abdomen was taken to determine whether or not gas was present under the diaphragm. Roentgenographic studies revealed gastric dilatation and a Levin tube was, therefore, inserted into the stomach and lavage instituted. Parenteral fluids were administered and opiates were given as indicated for the severe pain.

An electrocardiogram was taken shortly after admission, and a suspicious pattern was found suggesting an acute posterior wall myocardial infarction. Therefore, the patient was managed accordingly while other measures were instituted to rule out an acute abdominal emergency. Serial electrocardiograms confirmed the original suspicion, and further management was directed toward the cardiac problem. Anticoagulants were not given because of the prolonged prothrombin time and the previous history of spontaneous nosebleeds. Bed rest was enforced until June 15, at which time the patient was allowed to sit at the side of the bed for 5-minute periods. The blood pressure rose gradually following use of supportive measures and ultimately stabilized itself at 100/76. After the first 24 hours she was almost entirely free from pain, and opiates were discontinued. Sedatives, however, were required for sleep. Antibiotics, administered empirically for 5 days, were discontinued. There was no remarkable elevation in temperature during hospitalization. Five hundred cc. of whole blood were given intravenously June 7 with improvement. Despite the absence of pain, she continued to complain of belching and recurring epigastric distress. Pancreatic substance given with meals relieved these symptoms. Hematinics were also used for secondary anemia. Serial electrocardiographic studies continued to show progressive changes characteristic of a posterior wall infarction pattern. Gynecologic consultation confirmed a pregnancy of about 6 months. Cervicitis and endocervicitis, which patient states are sources of dyspareunia, prolapse of the right ovary, and a large Bartholin cyst were reported. Supportive measures until delivery and then surgery were recommended.

It was decided that since the infarction had occurred relatively late in pregnancy a normal delivery would be inadvisable, because increased intra-abdominal pressure might precipitate further occlusion and extension of the infarction. It was, therefore, decided that she be allowed to continue with pregnancy until shortly prior to the anticipated delivery date, at which time a cesarean section would be performed.

She was discharged from the hospital June 23 against recommendations. Her general condition at that time was satisfactory. Her family physician treated her at home with routine measures until shortly before the anticipated day of delivery. She was then hospitalized, cyclopropane was administered, and a cesarean section was performed. After an uneventful period of convalescence the patient was discharged from the hospital. She was last seen as an outpatient June 17, 1953. Electrocardiographic studies continue to show the residual changes of the old posterior wall infarction. She has been digitalized because of symptoms of congestive heart failure and is being maintained on digitoxin, 0.2 mg. daily, and is able to carry on normal household duties. Occasional extraventricular systoles occur which the patient recognizes as palpitations, but these are paroxysmal and are not particularly incapacitating. Except for digitalization and a salt-free diet, no other medication is being administered.

Case 2. A 29-year-old male medical student and part-time director of a band for which he plays solo parts on wind instruments presented himself at the Osteopathic Hospital on November 29, 1952. At 10 p.m. he experienced severe pain in the left side of the chest with radiation down the left arm to the fingers, with a cold clammy sweat. Prior to the onset of pain he had been exerting himself rather strenuously. When the pain failed to abate after several hours, he became concerned and presented himself for examination.

While he was an outpatient, an electrocardiogram was done which showed nonspecific changes suggesting a transitory cardiac anoxia. However, he was hospitalized for observation. The electrocardiogram was re-examined on the following day with equivocal findings. Nevertheless, it was decided to keep the patient in the hospital for continued observation (Fig. 2). On December 2, the electrocardiogram showed the first changes consistent with a diagnosis of posterior wall myocardial infarction. Successive records showed characteristic progressive changes, and the patient was placed upon a rigid regimen for the condition.

The patient stated that he had been an asthmatic for approximately 8 years and had a chronic cough, nonproductive in character. With the onset of the acute chest pain the asthmatic condition became aggravated and worsened in the prone position. Improvement was obtained in the sitting position, and additional relief was also secured by avoiding deep inspiration.

Inventory by Systems.—The patient was a young, unmarried, obese male. During the previous year he had gained 15 pounds (present weight 240 pounds, height 5 feet 11 inches). Appetite was usually good, although he became nauseated following the onset of acute precordial distress; the chest pain was associated with belching and flatulence. Bowel movements were normal. Genitourinary system was essentially negative. Patient was an intelligent male with good memory, stable personality, and sociable. He smoked 3 packages of cigarettes daily. A previous diagnosis of duodenal ulcer had been made, and he had used antacids at intervals. He drank 8 cups of coffee daily and had used amphetamine sulfate at intervals in an attempt to lose weight. He was a senior student and, because of his dual occupations, slept less than 8 hours daily. Previous health was satisfactory, but he had had bronchial asthma for 8 years. He had had the usual childhood diseases including "spinal meningitis," and a tonsillectomy at 12 years of age. He denied venereal diseases.

Physical Examination.—Apprehensive obese male. Blood pressure 116/78. Skin ashen in color, cold and clammy. Nasal septum deviated to the right; no nasal

discharge. Pharynx inflamed. No cervical lymphadenopathy; thyroid not palpable. Thorax appeared to be emphysematous. Auscultation of the chest: Coarse moist and dry rales heard at the bases of both lung fields. Expiratory wheezing heard throughout chest. Persistent nonproductive cough. Heart: Point of

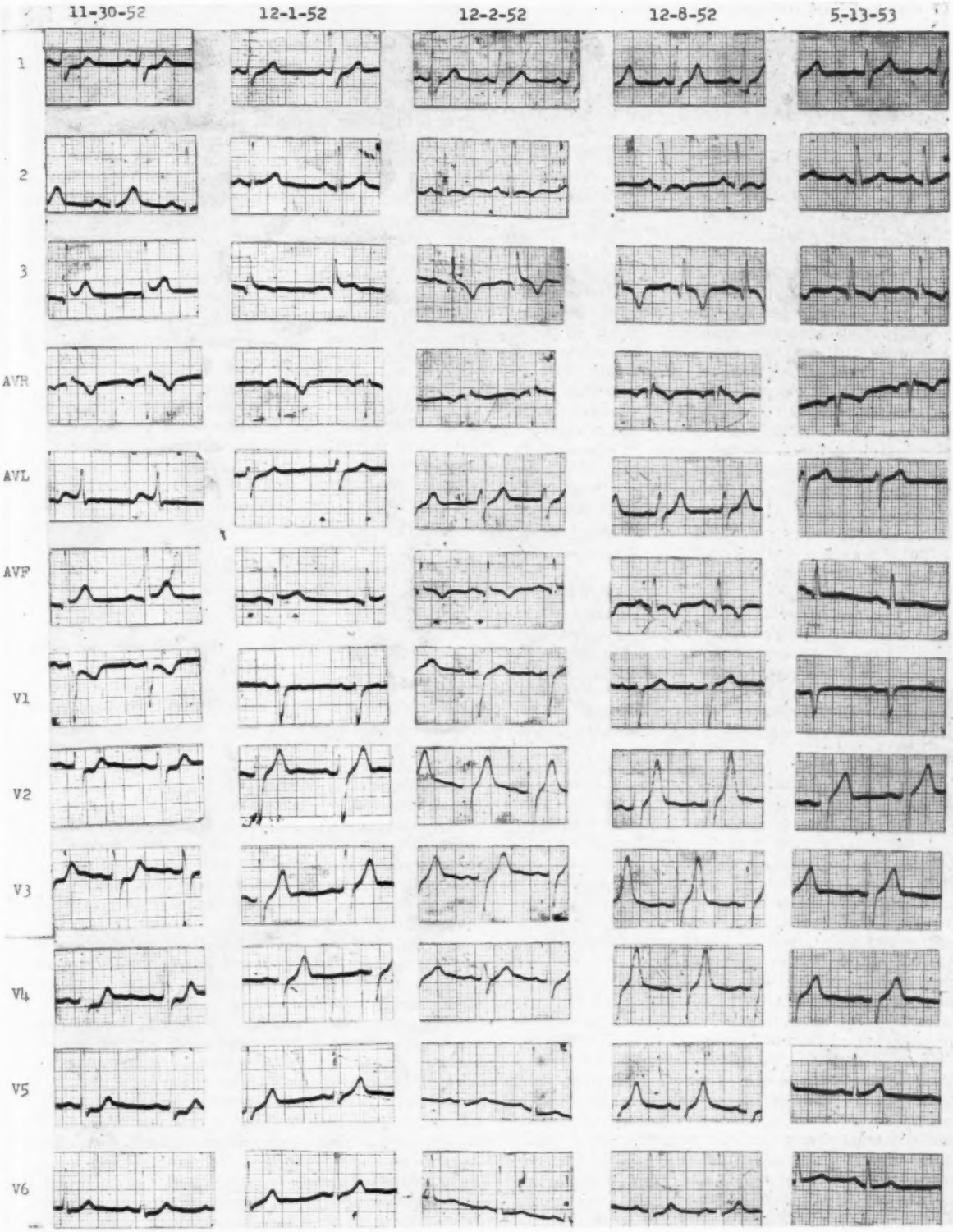

Fig. 2. Serial electrocardiograms of a 29-year-old man with acute posterior wall myocardial infarction. The last tracing represents residual changes approximately 6 months after the original episode.

maximum impulse is in the fifth interspace in the midclavicular line; no murmurs, rhythm regular; tenderness elicited in the right upper quadrant as well as in the epigastric region. Neurologic evaluation: essentially negative. Genitals and rectum: negative.

Laboratory Findings. — Urinalysis (November 30): color, light amber; character, slightly cloudy; reaction, 5.0; specific gravity, 1.028; albumin, negative; sugar, negative; microscopic: leukocytes, negative; erythrocytes, rare; epithelial cells, negative; casts, negative; bacteria, negative.

Sedimentation rate studies: (November 30) 12 mm. fall in 1 hour; December 3, 22 mm.; December 6, 22 mm.; December 9, 23.5 mm.; December 10, 24 mm.; December 16, 22 mm. Bromsulphalein test (December 2): 30-minute specimen, 19 per cent dye retained; 60-minute specimen, 10 per cent dye retained. Urea nitrogen: (December 1) 26.8 mg. per 100 cc.; (December 4) 17.1 mg. per 100 cc. Cholesterol (December 1) 275 mg. per 100 cc. Kahn, negative. Lee-White clotting time (in minutes): December 2, 10; December 3, 10½; December 4, 11; December 5, 11; December 6, 10; December 7, 7½; December 7, 14½; December 8, 13; December 9, 14; December 10, 9; December 12, 11; December 13, 11; December 14, 11; December 15, 8½; December 16, 10; December 17, 11. Phenolsulfonphthalein intravenously (December 1): four 30-minute specimens: first specimen, 37 per cent dye retained; second specimen, 38 per cent; third specimen, 7.5 per cent; fourth specimen, 3.5 per cent.

Blood counts: (November 30) erythrocytes, 5,870,000 per cu. mm.; leukocytes, 13,600 per cu. mm.; hemoglobin, 18.15 gm. per cent (117 per cent); color index, 1.01; clotting time, 6½ minutes; differential white count: eosinophils, 3 per cent; juveniles, 1 per cent; segmented polymorphonuclears, 56 per cent; lymphocytes, 38 per cent; monocytes, 2 per cent; (December 3) erythrocytes, 4,850,000; leukocytes, 11,950; hemoglobin, 15.6 gm. per cent (101 per cent); color index, 1.04 differential white count: stab cells, 4; segmented polymorphonuclears, 76; lymphocytes, 17; monocytes, 3.

Course and Management.—The patient was hospitalized from November 30 until December 20. Serial electrocardiograms continued to show the characteristic changes consistent with the diagnosis of an acute posterior wall myocardial infarction. The record taken on the third day following admission to the hospital indicated clearly the characteristic electrocardiographic changes. The patient was heparinized with Depo-heparin and maintained on this treatment until his discharge from the hospital. A cholesterol-free diet was prescribed. Aminophylline was given orally throughout his hospital stay, and the patient reported that he was free from his asthmatic distress throughout the entire period of hospitalization. It was felt that the relief could be attributed to the aminophylline therapy. On December 2 there was a temperature rise which reached a maximum of 101.5 F. on December 3. The temperature returned to normal December 6 and remained normal throughout the remainder of hospitalization. Demerol was given during the initial phase of therapy for relief of pain, and papaverine hydrochloride was given parenterally at regular intervals for 48 hours regardless of the presence of pain.

The patient made an uneventful recovery and, as noted above, was completely free of the asthmatic complication throughout the entire hospital stay. This was believed to be due to aminophylline therapy. He was discharged December 20 for further management by a local physician at home. After an 8-week period, the patient resumed his previous activities, graduating from school several months later.

During the third month following the initial attack, the patient developed paroxysms of extraventricular ectopic beats. However, there was spontaneous return to normal sinus rhythm without specific medication being administered. He has been observed at regular intervals until the present, and the electrocardiographic record, except for an inverted T wave in Lead III, which is a normal variant, may be considered normal. Serial electrocardiograms at regular intervals have shown stabilization without any change. The patient's condition is satisfactory except for occasional precordial distress on exertion. He keeps nitroglycerin tablets with him, and they have been used on several occasions, sublingually, when the anginal attacks were extremely distressing. The medication gives him instantaneous relief. He has shown no signs of cardiac decompensation.

CONCLUSIONS

Two cases of acute coronary occlusion with posterior wall myocardial infarction are presented. The first case, that of a 24-year-old pregnant woman, is relatively rare. Although several cases in young pregnant women have been reported in the literature, they have invariably occurred during the first trimester of pregnancy,[12] and the patients were allowed normal deliveries with good results. This patient developed the infarction during the early part of the third trimester of pregnancy, and it was deemed advisable to perform a cesarean section as the least harmful course.

The patient might have been delivered normally, but death might have resulted. The increased cardiac output which ordinarily occurs during the last trimester of pregnancy might have precipitated acute congestive heart failure since there already was an excessive load on the heart. The increased intra-abdominal pressure during uterine contractions might have produced compensatory coronary artery constriction which might have resulted in an extension of the infarction. The literature is very meager in discussing the management of myocardial infarction in pregnant women, and it was necessary to make the serious decision, namely, to perform a cesarean section prior to the anticipated time of delivery in preference to delivery through the normal route.

It was felt that the possibility of development of congestive heart failure after delivery justified the decision to perform a cesarean section. The cases reported in the literature which occurred during the first trimester of pregnancy undoubtedly had adequate healing of the infarcted myocardial areas, and normal delivery in these cases seems to have been justified.

In both cases presented, an elevation of the blood cholesterol was noted. While the mechanism was probably different in each instance, it called attention to the possible relationship between cholesterol metabolism and coronary artery sclerosis. The male patient was an obese individual known to eat foods rich in cholesterol. This may have played an important part in his hypercholesteremia. The female patient may possibly have developed the high blood cholesterol as a result of the metabolic changes associated with pregnancy.

Recent experimental work seems to indicate that estrogens inhibit cholesterol-induced coronary atherosclerosis in chicks,[13] and it may be postulated that this factor is the reason for the lesser number of cases of coronary sclerosis with occlusion in the female. In view of the many pregnancies which the patient had had, it may be theorized that the function of the ovarian tissue may have been sufficiently depressed to negate the antagonistic effect of the estrogen.

The male patient was placed on anticoagulant therapy; the female was not. It is believed that the decision not to use anticoagulants in the female was justified in view of the history of nasal bleeding and the prolonged prothrombin time. The use of anticoagulants, although fairly routine at the Osteopathic Hospital, is still not a universally accepted practice.

These two cases are presented as contributions to medical literature, the first case, that of the young housewife, being a most unusual example of acute myocardial infarction occurring during the third trimester of pregnancy. Both cases classically illustrate the necessity for serial electrocardiagrams.

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Prevention of Dermatoses in the Newborn*

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There has been a great deal of interest in recent years in attempts at elimination of dermatoses of the newborn. In the last 25 years, innumerable articles have discussed the effectiveness of various preparations in the care and prevention of all types of rashes. These articles show not only continued interest in this problem but also a great lack of unanimity as to the proper method of skin care. The suggestions run the gamut from much skin care to the "no-bath technic" in which absolutely nothing is done to the skin. At present the consensus is that the less manipulation there is, the less is the danger of infection.[1,2] In spite of this opinion, the "no-bath technic" is used in only a comparatively few hospitals. The routine in the nursery of the Metropolitan Hospital has been to wash the infants with warm sterile water on sterile cotton. Most of the vernix is removed, and the infants are generally cleansed. A preliminary survey of this technic revealed that approximately 24 per cent of all infants developed some form of rash during the first week of life. According to recent literature, this relatively high incidence of rashes is not unusual; in fact it was found in carefully controlled studies[1] that 25 per cent of all infants born in the hospitals of the United States have some form of rash in the newborn period.

There have been several articles published in the last 10 years on cod liver oil ointment for therapy in various dermatoses. In our hands cod liver oil ointment has proved to be a safe and very satisfactory preparation in the treatment of most of the skin rashes encountered in our nursery, even though most of them are simple minor skin irritations, such as miliaria, inflamed buttocks, and excessively dry skin. Pustular rashes have been very few in the nursery of the Metropolitan Hospital. Nevertheless the minor skin irritations cause concern, and it would be very desirable if they could be eliminated. With this thought in mind, it was decided to study the effect of cod liver oil in a base containing zinc oxide, talc, petrolatum, and lanolin,† from the prophylactic point of view.

PROCEDURE

Each infant on admission to the nursery of the Metropolitan Hospital was washed with warm sterile water and sterile cotton until most of the vernix was removed and the infant generally cleansed. The infants of the control group were bathed daily with sterile water, and if any rash appeared, cod liver oil ointment was used as therapy.

The infants of the experimental group had a thin application of the cod liver oil ointment made after the initial bathing with sterile water on cotton. Thereafter, daily applications of Desitin Ointment to the entire body were made after each diaper change.

RESULTS

In the control group of 215 infants, 61 developed rashes, an incidence of 27.5 per cent. In the experi-

*From the Department of Pediatrics, Metropolitan Hospital, Philadelphia.

†The cod liver oil ointment (Desitin Ointment) was supplied by the Desitin Chemical Company, Providence, R. I.

mental group of 216 infants, 19 developed rashes, an incidence of 8.8 per cent (Table I). Rashes were grouped into those which appeared on the buttocks, face, and chest. The rashes on the buttocks were most common in both groups, rashes on the face were next most common, and rashes on the chest the least common (Table II).

TABLE I—INCIDENCE OF SKIN RASHES IN 431 NEWBORN INFANTS

	Total Number of Cases	Total Number of Rashes	Percentage
Control Group	215	61	27.5
Experimental Group	216	19	8.8

TABLE II—LOCATION AND DURATION OF RASHES

	Location	Number of Cases	Average Duration in Days
Control Group	Buttocks	55	3
	Face	8	2
	Chest	5	2
Experimental Group	Buttocks	11	1½
	Face	4	2
	Chest	4	1½

In the control group, 67 infants developed rashes on the buttocks, 8 developed rashes on the face, and 5 developed rashes on the chest. The total number of rashes according to the site of involvement is more than 61 (the total number of infants affected) because some of the infants developed rashes on more than one site. In the experimental group, 11 infants developed rashes on the buttocks, 4 developed rashes on the face, and 4 developed rashes on the chest.

In the control group the majority (20) of the rashes on the buttocks lasted for 2 days, and one rash lasted 7 days. The majority of face rashes lasted for 1 day, and one lasted for 5 days. On the chest all of the rashes lasted for 2 days. In the experimental group, the majority of the rashes on the buttocks lasted for 1 day, and none longer than 3 days; the 4 cases of facial rash lasted for 1, 2, 3, and 4 days; and on the chest, two rashes lasted for 1 day, and the other two for 3 days. The small number of cases with rashes does not permit a valid statistical evaluation of the significance of these findings with regard to duration of the rashes.

SUMMARY

1. The problem of dermatoses in the newborn has been reviewed.

2. Four hundred and thirty-one newborn infants were observed. Half of these infants served as controls, and of this group, 27.5 per cent developed some type of skin rash. The other half were treated prophylactically with cod liver oil ointment. In this group, only 8.8 per cent developed rashes, and these were of a very mild character.

3. Cod liver oil ointment showed definite possibility as a means of prophylactic treatment of dermatoses of the newborn.

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CARITAS MEDICI

For those whose cortex is not congealed (and in these humoral days I must specify cerebral, not adrenal cortex), there is fascination in speculating about what future medical historians, say 50 or even 500 years from now, will think of us. Each age mercifully thinks of itself as being the best and by definition is the most modern and contemporary. Without being morbid or melodramatic I will point to certain features of modern medicine which should be of special concern to you who by natural endowment or hard work have demonstrated qualities of scholarship and leadership. Physicians as a group are no longer distinguished for their contributions to or knowledge of humane letters. The curious concentration upon accumulating data, the mesmerization in developing techniques, the hypnosis of applying tests, have all inevitably tended to separate the individual physician further and further from contact with the patient. In any art or craft the nearness of the artisan and material is measure of its validity, and in the art of medicine this nearness of patient and physician must be maintained in spirit as well as in substance. Moral values, historically the binding link between the good physician and his patient, have been relegated to a corner or thrown bodily out of the door at no little hurt to the proper aim of medicine. —William Bennett Bean, M.D. *A.M.A. Archives of Internal Medicine*, August, 1953.

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I—THE CLINICAL ASSEMBLY—A STUDY OF TRENDS

The Twenty Sixth Annual Clinical Assembly of the American College of Osteopathic Surgeons, held in October in Los Angeles and reported editorially in the November JOURNAL, reveals two diverse and apparently contradictory influences at work within the osteopathic sector of organized medicine. At the same time it serves as an example of the power of numbers dedicated to a purpose.

Readers of the November JOURNAL must have recognized that the editorial report on the Clinical Assembly occupies the position traditionally used for reporting the annual convention of the American Osteopathic Association. This place of honor was frank and rightful recognition of the vital role which the Assembly—no longer a gathering of osteopathic surgeons but a joint meeting of five specialty groups—plays in the teaching life of this profession. The Clinical Assembly has enabled each of its component bodies (surgeons, orthopedists, anesthesiologists, radiologists, and hospital administrators) better to consummate their organizational purposes—the continuing education of their membership. Each of these specialty groups has properly become a teaching body.

Yet the individual societies that make up the Assembly show no technics of program-making or methods of teaching which render their meetings distinguished beyond those of other specialty groups that meet individually. For at least 5 years the annual program meetings of every specialty group of this profession have been broadly conceived and well executed.

What is it that makes the Clinical Assembly unique? Why was its 1953 meeting given a position of distinction in JOURNAL reporting? The answers are simple. As a convention, the Assembly possesses weight, quite literally. It has become a mechanism by which five different organizations comprising almost a thousand people get to a given place at a given time, are made more comfortable, are better served, and their respective purposes are better expedited, than they would be were they meeting separately.

The Clinical Assembly, even though its components retain their autonomy, presents the appearance of a single body. Embodied in the Assembly each group becomes more impressive, each speaks with a voice of greater authority, and each finds the value of its buying power is greatly augmented. Even the individuals feel a greater assurance. And the public is properly impressed because newspaper column inches are greater.

As a sizable meeting, the Clinical Assembly satisfies the American penchant for "bigness"—recognition in hotels and cities begins with registration at the near-thousand figure. And the Clinical Assembly is an impressive body. These tangible aspects give it authority. The osteopathic profession is proud of this collective effort. THE JOURNAL gives it rightful recognition.

The Clinical Assembly possesses intangible aspects which are high in value and serve to make the meeting of its bodies more distinctive than those of individual groups. Each component of the Assembly experiences a sense of power beyond that justified by its actual numbers. It develops the illusion of a mass base without actually possessing such a base. And that is an illusion necessary to the continued growth and development of small groups, even those relatively small. The Clinical Assembly also affords an opportunity for wide personal interchange in corridors, in rooms, around luncheon tables, and in the give and take of 5 days of close proximity.

There was a period in the Clinical Assembly's life when the College of Surgeons, organizationally and numerically the oldest and largest of the five groups, was roundly criticized for "dominating" the Assembly. An objective study of these meetings from their beginning fails to show any such intent or any series of overt acts by the administration of the College which would lend credence to the charge.

The Assembly began a quarter of a century ago as an organization of osteopathic surgeons. It became a co-active assembly as group by group came in. Strong leadership by the College was inevitable and necessary to the formation of an organization which functions only 5 days annually and which retains for its constituent groups all their basic autonomies, even during their period of concurrency.

The four groups that join with the College of Surgeons in the Clinical Assembly would acknowledge the accuracy of this observation and would admit that the collective benefits of the Assembly negate the somewhat inevitable overshadowing by the larger and older body. The College could cite point by point its successful efforts in bringing wide benefits to the associated societies, thereby demonstrating the utmost consideration which it has extended to these bodies.

By the oldest process of learning, that of trial and error, these groups have achieved a remarkably harmonious relationship. It has been no mean task, and high credit must be given to every constituent body for forbearance, patience, and persisting determination.

The Clinical Assembly is an arrangement of convenience, an almost totally unorganized "organization" with capacity for a period of brief accomplishment vastly greater than its numerical strength suggests. Its achievement is largely within itself—five groups working together to the end that their individual needs can be better satisfied by concerted action. Working within its own success, however, it has made a contribution greater than that of gaining its own goal. The Clinical Assembly has demonstrated the essential oneness of five professional specialized segments of the osteopathic profession.

Today the Clinical Assembly stands forth in its own right as a distinctive achievement. It stands forth as proof of the remarkable penchant of the osteopathic profession to get on with itself, manifested in and out of season for decades. Herein lies the secret of an organizational strength out of all proportion to the profession's numerical strength. This the profession as a whole dare not forget, for it has entered into a period of segmentation and segregation outside its previous experience and one which bodes it ill, unless the probability of a dangerously weakened profession is recognized. That broad cross section of organized osteopathy which constitutes the annual convention of the American Osteopathic Association and the component bodies which make up the Clinical Assembly of the American College of Osteopathic Surgeons are among those groups which should be the first to recognize portents that are appearing on the horizon of organized osteopathy, portents that imply dissipation of strength and power of such force as to make for its disintegration as a unified force.

Specialization is a continuing process in medicine generally for new skills are inherent in its development. Therefore, specialization within osteopathy is a part of its inevitable evolution as a school of medicine. This segmentation will continue to reflect itself in both areas of organized medicine. Increasing specialization in medicine, necessary and inevitable as it is, if unchecked in its efforts, presents and interposes greater and greater obstacles to the goal of medical practice—good medical care for the people. In a period when old-school medicine envisages an era of "comprehensive" medicine, when students of the nation's health problems emphasize the role of the general physician, and at a time when leaders in osteopathic medicine are reinterpreting osteopathic medicine as an approach to the problems of health and disease conceived in terms of "the unity of the body," increased specialization is an anomalous and contradictory state.

Specialization as it affects old-school medicine numerically is relatively slight. Remove the specialists and there is a vast body of practitioners available. In this era of medicine, one of adaptation to a new age, there is an adequate body of experimental material in the form of general physicians. There is time, opportunity, and material for the social forces which are reshaping medicine to society's needs to produce the doctor of tomorrow to whom the specialist will be an aid, not a dominating figure. Carry specialization within osteopathic medicine to the proportionate degree to which it is now moving numerically, and osteopathy seems destined to disappear as a distinctive school of practice for it will have left no mass base upon which to readjust.

This problem of divisibility in osteopathy is sensed by almost all of our specialty groups individually; it has not become a commanding problem collectively. The time is ripe for the problem to be viewed collectively. At the Annual Meeting of the American Osteopathic Association in July, 1953, an attempt was made by representatives of various specialty groups to give the issue consideration. It was unsuccessful through no fault of the participating organizations.

The achievement of the Clinical Assembly points to the need for further examination of the technics and methods of achieving organizational unity, where it is mandatory to the continuance of the organizational strength and at the same time where it is necessary to safeguard the autonomy of participating bodies.

This problem has become one for the concern of the entire profession. It will be considered in great detail in subsequent editorials in THE JOURNAL.

OF PROFESSION-WIDE SIGNIFICANCE

The Foundation for Research of the New York Academy of Osteopathy, Inc., is one of osteopathy's most recently organized bodies. Incorporated in the state of New York on May 20, 1952, the Foundation stems directly from the New York Academy of Osteopathy, a constituent body of the nationally known Academy of Applied Osteopathy.

In mid-October the Foundation for Research held a conference in New York City, to which were invited representatives of various osteopathic groups concerned directly or indirectly with fundamental and clinical research under osteopathic auspices. Although these guests were chosen because of their position they participated in the meeting as individuals rather than as official exponents of the purpose and policy of given bodies.

The Foundation for Research was organized, in the language of its charter, "exclusively for charitable, scientific, and educational purposes." It proposes to direct itself toward the furtherance of the knowledge of osteopathy and the application of such knowledge. The body grew out of 3 years of careful planning by the Foundation Committee of the New York Academy, since the parent organization is not empowered to act in a foundation-like capacity. The Foundation was born out of realism. It exists in frank recognition that the furtherance of osteopathy through education and research requires large funds.

The New York City area geographically is a center of fund-raising potentiality and activity. Organized osteopathy needs the advice and help of local represen-

tatives in the area who are intimately acquainted with existing possibilities there and the methods of their development. It is not enough in this day of countless legitimate calls upon finance that a project is worth while and should have support—it is vital that the technics of project presentation be correct. If the approach is not right the project itself will not get a hearing. Although fund raising from private sources has become an almost scientifically analytical procedure, an opportunity to gain the necessary hearing is brought about most often by personal approach, backed by the integrity and selfless high aims of known individuals. Modern accomplishment is based upon law and order, but its springs of action remain concealed within human appeal.

The Foundation for Research is made up of not more than twenty Fellows elected from the New York Academy of Osteopathy and six ex-officio members, one of whom shall be the President of the American Osteopathic Association. The management of the affairs and property of the Foundation is vested in a Board of Directors of nine members. The president currently is Dr. W. Kenneth Riland, the vice-president, Dr. J. Marshall Hoag, and the treasurer, Dr. William O. Kingsbury. The secretary is Maxwell H. Tretter. The officers are residents of New York City and its environs and, with the exception of Mr. Tretter, are practicing osteopathic physicians.

Guests attending the October conference rated it as a challenge to the Foundation to serve as a correlative and interpretive agency of a type hitherto not available to organized osteopathy. As representatives of various professional bodies guests saw themselves challenged to an integrated and cooperative effort of a new type. All felt the meeting had expanded the horizons for the osteopathic profession.

As a 2-day period of stocktaking, interpretation, and clarification, it is important that the immediate results of the meeting be brought widely to the attention of the osteopathic profession. A forthcoming issue of THE JOURNAL will attempt to make such a presentation to its readers.

Upon a score of osteopathic fronts a new day dawns. Members of the profession can ill afford not to be informed and to bring into their thinking a new breadth of vision. The Foundation for Research of the New York Academy of Osteopathy, Inc., is another herald of the new day.

A CORRECTION

An editorial entitled "Research and the Public Health," in which specific reference was made to the Public Health Service Research Grants administered under the National Institutes of Health, was published in the September JOURNAL. The editorial carried the implication that none of the osteopathic colleges have been the recipients of such grants. The fact is that an osteopathic college received a grant from the Division of Research Grants in 1947 and has continued to receive such grants each year.

The editorial did not make plain its intent which was to call attention to another phase of the grants program, that of the Public Health Service Research Fellowships. These research fellowships are awarded by the Public Health Service for the purpose of developing competent research workers in the medical sciences related to health problems. These fellowships may be awarded to applicants holding the Bachelor's degree, Master's degree (or the equivalent in graduate training), or Doctor's degree.

The hope was expressed editorially that osteopathic colleges would encourage the development of young students of such ability as to make them eligible for development as competent investigators under the research fellowship program. Emphasis was placed on "the highly disciplined procedure that awaits capacity upon the part of the individual to receive such training, and the originality of mind which later makes possible creative scientific achievement."

Notes and Comments

At the recent Seventh General Assembly of the World Medical Association held at The Hague, Netherlands, the two delegates and two alternates of the American Medical Association officially represented American medicine. Observers were present from other American organizations, such as the American College of Physicians and the American Academy of General Practice.

Among the seventy-one observers accredited from the United States Committee was Dr. Vincent P. Carroll, past president of the American Osteopathic Association, who was registered as an osteopathic physician and surgeon. The October JOURNAL reported Dr. Carroll's attendance at The Hague and carried a brief statement concerning W.M.A. and its aims.

Dr. Carroll reports that delegates from thirty-five countries were present and that greetings were extended by represenatives of nearly a score of international organizations. Official languages of the Assembly were English, French, and Spanish. Delegates were welcomed by Dr. George Krimpas (Greece). In his presidential address, Dr. Krimpas recalled the Greek tradition of passing on the lighted torch, and likened the return of the Delegates to this ceremony. Greetings were extended to the meeting by the Dutch government and the Royal Dutch Medical Association. Dr. L. A. Hulst of the Netherlands was confirmed as President of the World Medical Association for 1953-1954.

Dr. Hulst, speaking as the new president, termed W.M.A. "an association of the free National Medical Organizations [which] supports the fundamental principle, 'Society must guarantee the physician independence in his own field.'" He emphasized the importance of the W.M.A. provision that all countries, big and

small, have two and only two votes in the General Assembly. World Medical Association makes recommendations and suggestions—"that is all it can and will do."

Dr. Carroll reported the entire agenda one of great interest. The entire Assembly stood in silent tribute to the memory of Dr. Elmer Lee Henderson of Kentucky, a past president of W.M.A. Dr. Austin Smith, editor of *The Journal of the American Medical Association*, was appointed to fill the unexpired term of Dr. Henderson on the Council.

W.M.A. instructed its Council to consider the advisability of assuming the publication of the second edition of "World Medical Periodicals," previously published under the auspices of WHO and UNESCO. Dr. Morris Fishbein, editor of the *World Medical Association Bulletin*, agreed to the recommendations that an Editorial Board be selected to function in an advisory capacity and to recommend changes in the present format and in the matter of presentation of materials in the *Bulletin*.

One of the highlights of the meeting was the total picture of world medicine gained from the reports of secretaries of various nations, especially those reporting from Asia and Australasia. European reports dealt at considerable length with the socio-economic problems that beset these countries. In this connection a most important report was that of the General Assembly Committee on Social Security. All delegates were obviously deeply concerned with this problem although there was a wide divergence of opinion on how far social security should be carried, even though the delegates all felt that an exchange of views was most necessary. The position on social security of the United States delegate, Dr. Gunnar Gundersen, represented in essence that of the American Medical Association. The General Assembly instructed its Council to undertake a study to provide a plan whereby the poor of all nations will be assured medical care without lowering the standards of medical care and which will not result in social security development detrimental to medicine. The Assembly also declared that the medical profession "ought to reject categorically, any method of remuneration [of doctors in the Social Security structure] which could have a harmful influence on the quality of medical care or would not conform to the principles of medical ethics."

Dr. Carroll advises that the meeting adjourned to convene as the Eighth General Assembly in Rome, Italy, in 1954. THE JOURNAL appreciates his co-operation in making these facts available.

★ ★ ★

Cigarette makers were challenged last month to conduct research projects to prove or disprove a possible relationship between cigarette smoking and bronchogenic carcinoma. The challenge was made as the American College of Surgeons met for the thirty-ninth annual clinical congress of that body in Chicago. A round table discussion program on this subject was conducted by Northwestern University, based on research projects which had been undertaken at Washington University, St. Louis, and Tulane University School of Medicine in New Orleans.

Dr. I. S. Ravdin, Professor of Surgery of the University of Pennsylvania, chairman of a portion of the annual clinical congress, made the following statement as reported by the *New York Times*: "Within the past five years, there has been an increasing amount of evidence that there is a certain factor in cigarette smoking that helps to cause lung cancer. There are many specialists who believe that cancer of the lungs is the leading cancer problem.

"In a matter which involves public health to such a big degree, the tobacco industry has a moral obligation to pay for the research necessary to prove or disprove the suspected relationship between smoking cigarettes and lung cancer. The tobacco companies ought to put up the money to settle this problem. Who else should be more interested?"

The research projects thus far have been done largely in university research centers, hard-pressed though they are for funds.

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Another alleged "cancer cure" has come out of California and is termed "arginase," which is a naturally occurring chemical found in the liver. Proponents of the treatment include a dentist, formerly connected with the University of California College of Dentistry; a Hindu biology student; a Los Angeles physician and surgeon; and an operator of a mortuary college in San Francisco. The California Medical Association has denounced the treatment following an investigation.

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In Brief: The August 8, 1953, issue of the *Journal of the American Medical Association* describes in detail a technic of cardiac resuscitation including artificial respiration, cardiac massage, intravenous fluids, and blood, drugs, and defibrillation by means of electric shock. . . . The *American Journal of Pathology*, July-August, 1953, reports thirty-one consecutive cases of infants dying suddenly while in apparently good health and with gross necropsy findings insufficient to explain death, which were studied microscopically. In all cases there were microscopic inflammatory lesions in the upper and lower respiratory tracts. Vascular changes in the respiratory tracts and characteristic reactions in the spleen, lymph nodes, and thymus gave evidence that death resulted from a fulminating respiratory disease. . . . Cases of subacute deltoid bursitis showing calcium deposits were given injections of 1,000 meg. of vitamin B_{12} with excellent results in many cases. . . . At a recent meeting of the American Chemical Society, Dr. Harold C. Urey, well-known atomic scientist, urged that the United States Government turn over the development of atomic energy to private industry. He warned that the United States at its present pace in promoting industrial use of atomic energy might fall behind the advances of other nations. . . . Newest antibiotic is magnamycin reported upon in Rome last month at the Sixth International Congress of Microbiology. It shows no cross resistance with other important antibiotics. Its specific value appears to be its activity against the rickettsial diseases, psittacosis, and amebiasis.

SPECIAL ARTICLES

Isotopes Today and Tomorrow*

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In accepting your invitation to deliver the Trenery Lecture for 1953, I am deeply sensitive to the honor you have accorded me. It is indeed a great privilege to commemorate Floyd J. Trenery, a distinguished radiologist, and a founder of the American Osteopathic College of Radiology.

As a radiation therapist, I am particularly gratified to do honor to Dr. Trenery's memory because of his great interest in and his many contributions to radiation therapy. It is now just 10 years since Dr. Trenery's death at the altogether too young age of 51. His early passing left a great gap in the ranks of radiology, but his life is an inspiration and a stimulus to those who remain to carry on his great work.

Artificial radioactivity was discovered in 1934 by Joliot and Curie. This discovery provided a revolutionary means of studying physiologic and biochemical processes in living organisms. The clinician has been enabled by radioisotopes to observe the physiologic and pathologic behaviors of the human body, and he has also been afforded a new type of drug for the treatment of certain diseases. Before the discovery of radioisotopes, classical chemistry comprised the only means of analyzing the constituents of living tissues and of studying body mechanisms of assimilation, distribution, and elimination of various elements. Classical chemistry enables the observer to determine qualitative and quantitative data as of a single moment in the physiologic cycle. It is not capable of illuminating the dynamics of metabolism. The use of radioactive properties of elements which are physiologic constituents, circumvents the limitations of classical chemistry in this respect. For such radioactive elements, by reason of the radiation they emit, can be traced throughout their course in the body. This is true whether the radioactive atoms are combined in organic or inorganic molecules. Thus the role played by the atoms in normal or pathologic function can be followed from the moment of administration to final elimination.

This fact has opened a vast field of experimental possibilities—but this evening, rather than attempting to cover these possibilities, I shall deal only with some clinical experience in the use of radioactive isotopes.

Isotopes are atom forms of an element which differ from the parent atoms only with respect to their mass. With regard to chemical behavior, all isotopes of a given element are indistinguishable. Some elements occur in nature in various isotopic forms. An example is uranium, which has naturally occurring isotopes of masses 233, 235, and 238 on the atomic weight scale. Other elements, on the other hand, occur in nature in one form only. Such a one is phosphorus, which has an atomic weight of 31. By bombardment with subatomic "bullets," such as alpha particles, neutrons, deuterons, and protons, isotopes with differing atomic weight and radioactive properties can be produced from any element. These radioactive atoms will then in turn and for a limited period emit either alpha particles or beta particles and gamma rays. It is this quality which makes such radioactive atoms subject to detection by Geiger counters, scintillation counters, and ionization chambers during the period in which they emit radiation.

There are several hundred known radioactive isotopes, but so far, relatively few of them have attained clinical significance. These are: sodium, potassium, phosphorus, iron, iodine, cobalt, chromium, gold, and carbon.

When these elements are administered to a living body as soluble or insoluble compounds, they may participate in metabolic processes or they may be phagocytized and localized in one type of tissue without true participation in metabolism. The course they will follow is naturally determined by the role of the particular compound or element in physiologic function. Some elements, for example, are almost entirely extracellular constituents, while others are predominantly intracellular. By selection of suitable isotopes, therefore, intracellular or extracellular mechanisms can be studied under normal and pathologic conditions.

A radioactive element, to be useful in clinical practice, must fulfill certain criteria:

1. The radiation emitted must be measurable with relative ease.
2. The material must be readily available in high specific activities.
3. The period during which the atoms will remain radioactive—referred to as the half-life—must not be too long or too short, in no case shorter than 10 hours.
4. The element must be nontoxic in the amounts which are to be used.
5. The material must be a substance which is utilized by the system to be studied.

Let us now consider some examples of the application of these principles to clinical problems. Sodium is an extracellular metabolite. It has been used extensively in the study of the cardiovascular system. Radioactive sodium is a beta and gamma ray emitter. Striking and characteristic patterns of circulation rate have been determined for normal individuals, patients with arteriosclerosis, scleroderma, vascular spasm, and obliterating endarteritis. Not only has radiosodium provided a means of differentiating these conditions through establishment of circulation rates, it has also been useful in predicting the outcome of various forms of treatment such as sympathectomy or drugs.

In studies of circulation time with radiosodium, it is of paramount importance that all measurements be made under strict temperature control. Slight

*Trenery Lecture presented before the American Osteopathic College of Radiology and the participating organizations at the Clinical Assembly, Los Angeles, October 18, 1953.

changes of surrounding temperature affect the cutaneous vascular bed and cause wide variations in findings.

Radiosodium is now considered the most accurate means of determining extracellular fluid space. In this way it is used to study edema and to detect subclinical edema. Studies of rate of transfer of radiosodium across the placenta have led to easy diagnosis of placenta previa.

Another element, phosphorus, is a ubiquitous intracellular and extracellular metabolite. It is therefore useful in studying a variety of physiologic functions. P^{32}, the isotope of phosphorus which has been available for clinical use to date, is a beta emitter, and the short range of beta particles limits considerably the detectability of the isotope in deep-seated tissues of living organisms. Nevertheless, P^{32} has important uses in diagnosis. One of these is in the determination of blood volume. This consists of labelling the red corpuscles of a sample of donor blood with P^{32}. These labelled corpuscles are injected into a subject; after a suitable interval the dilution of labelled corpuscles by the recipient's blood is determined by radioactive assay, and from this data the volume of circulating erythrocytes can be calculated.

An element which has recently come into prominence in connection with blood volume determination is radiochromium. Its exchange rate from red blood cells is much slower than that of phosphorus, and therefore blood volume changes over periods of several days can be observed with radiochromium.

Early experiments with radiophosphorus showed that phosphorus is concentrated with high selectivity in malignant neoplastic tissue. Based on this observation, a diagnostic procedure has been developed for differentiation between benign and malignant tumors in the breast, the testes, and the eye. In our own experience with over 200 patients with breast tumors, the method has proved accurate in 91 per cent of malignant lesions and 93 per cent of benign tumors. Certain tumors such as mucoid carcinoma are not detectable by this method because of the biologic behavior of this particular type of tumor. The use of P^{32} in tumor detection is limited to tumors which are located no deeper than 0.5 to 0.8 cm. below the surface, because of the short range of beta particles of radiophosphorus. Quite recently, radiopotassium, which is a predominantly intracellular metabolite, has been used for breast tumor detection with the same degree of accuracy attained as with radiophosphorus. Radiopotassium is a gamma ray emitter and so facilitates the detection of deep-seated tumors which may be lurking anywhere within the body.

In a number of hematologic conditions, knowledge concerning site and rate of production of red cells is of great importance. Radioiron serves to demonstrate the process of red cell formation. In the complex disease of polycythemia, radioiron is valuable as an aid in differentiating between true polycythemia and secondary polycythemia, which is due to cardiac or pulmonary disease or other conditions. Radiocarbon incorporated into the compound glycine is useful in studying the life span of red cells which is shortened in certain hematologic conditions.

The radioactive element most widely discussed is radioiodine. Since iodine is an organ-bound metabolite of the thyroid gland, its rate of concentration and release from the thyroid can be correlated with thyroid function. In hypofunction of the thyroid, the rate of concentration and release is slow. In hyperfunction, the rate is accelerated in comparison to the normally functioning gland. Thyroid tissue which does not produce hormone utilizes no iodine.

These simple facts led to the use of radioiodine as a diagnostic method for distinguishing differentially between various thyroid conditions, by simply determining the concentration of radioiodine in the thyroid. Few problems in medicine illustrate as well as thyroid conditions the truth of the saying that the more one knows about a subject, the more complex it becomes. In clear-cut cases of hypothyroidism or hyperthyroidism, radioiodine concentration in the thyroid is a definitive diagnostic criterion. In borderline cases, however, there is considerable overlapping of concentration values, and therefore it is not a diagnostic aid in such cases. It is in just such cases, of course, that the diagnosis is impossible clinically and a valid laboratory method of diagnosis would be of great value.

Experience shows that the clinical usefulness of radioiodine depends upon linking the utilization of iodine to thyroid function by more complete investigation of the dynamics of iodine metabolism. This requires the determination of organic and inorganic radioiodine in the blood, the clearance rate of radioiodine from blood plasma and through the kidneys, as well as the amount originally concentrated in the gland. Thus any diagnostic study with radioiodine is of real value only if it encompasses the whole cycle of iodine metabolism. Even then it may not be completely definitive because of the variability of behavior of biologic material. For this reason, it seems wiser to regard radioiodine as one valuable tool for the investigation of thyroid disease which, combined with other laboratory procedures and with clinical observation, may serve to bring even borderline cases into the focus of correct diagnosis. Intravenous administration of iodinated serum albumen has been successfully employed in localization of brain tumors, and intrathecal injection is used experimentally to localize space-consuming lesions in the vertebral canal.

A review of the diagnostic uses of radioactive isotopes would be incomplete which did not take into account the biologic effects from the radiations of these substances. This factor constitutes a limitation with regard to the amount of radioisotope which can be safely used in an investigative procedure. Despite this limitation, radioisotopes are now established as valid and useful laboratory tools. Much has already been accomplished with radioactive isotopes in inorganic form. When it is possible to incorporate them into a variety of organic compounds, their usefulness will be virtually unbounded, and it should be possible with their aid to study the most minute and intricate problems of physiology and pathology.

Let us now consider some therapeutic uses of radioactive isotopes. Radioactive isotopes may be considered as drugs whose effect is due to the ionization produced in passing through tissues. Their effect is similar to that produced by x-rays and radium. As a matter of fact, radioisotopes applied externally involve exactly the same considerations as x-rays and radium, namely, the quantity and quality used, the absorption in intervening tissues, and the dose delivered to the tissues. When radioisotopes are used internally, their therapeutic effect depends on the biochemical role of the element or compound which contains the radioactive atoms.

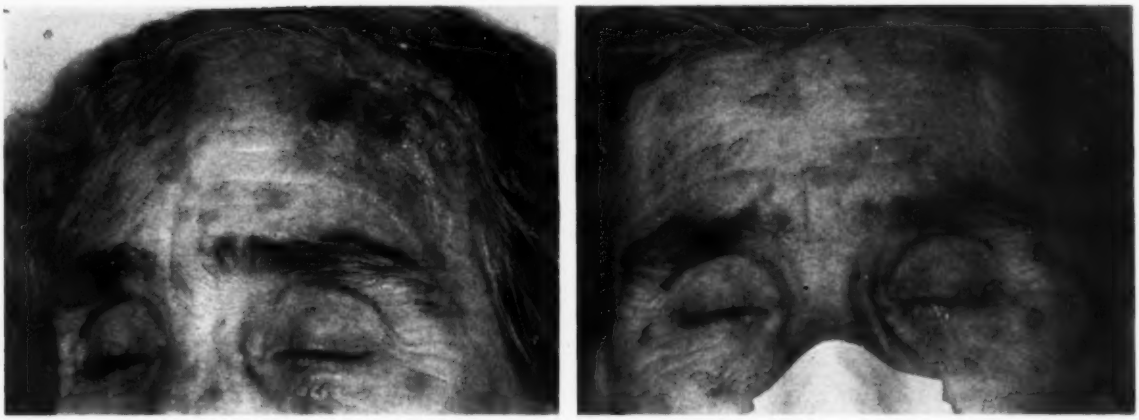


Fig. 1. Basal cell carcinoma, forehead, left side, before and after topical P^{32} treatment. Notice atrophy of skin in the irradiated area.

Tissues, organs, and organ systems concentrate metabolites selectively in accordance with their requirements and irrespective of the radioactive properties of the metabolite, so that a therapeutic effect can be attained if a tissue is capable of concentrating a particular radioisotope in adequate amount to deliver the desired dose of radiation. This fact, while it opens the way to employing a number of metabolites in radioactive form as therapeutic agents, at the same time accounts for certain limitations in the use of these materials.

Of the many known radioisotopes, only four so far have attained significance as therapeutic agents. These are soluble and colloidal radiophosphorus, radioiodine, radiocobalt, and radiogold.

As in any method of treatment, the therapeutic use of radioisotopes requires first, careful selection of cases, and second, appropriate dosage. A brief review of instances of successful use of radioisotopes as therapeutic agents will illustrate these points.

Radiophosphorus applied externally produces a tissue effect to a thickness of approximately 5 mm. Therefore, lesions located in the superficial layers of the skin involving the epidermis and the dermis not deeper than 5 mm., such as hyperkeratoses, basal cell cancers, and hemangiomas, can be destroyed by topical application of P^{32}. Figures 1 to 4 demonstrate the result of treatment in some such cases.

This method of treatment has resulted in eradication of superficial basal cell cancer in 97 per cent of cases, and of hyperkeratosis in 98.4 per cent of cases. It is particularly effective on curved surfaces where a homogeneous distribution of x-rays is impossible. It is effective in the treatment of strawberry type of hemangiomas, but I do not consider it advisable for port wine type of hemangiomas or deep-seated cavernous angiomas.

In passing, I may mention that Sr^{90} is a beta radiator with similar radiation characteristics to those of P^{32}. It has also proved valuable in the treatment of superficial skin and ocular lesions.

A number of localized neoplasms amenable to intracavitary and interstitial irradiation with radium and radon have recently been treated with various gamma ray emitter radioisotopes. The isotope which seems in many ways to be the most promising for intracavitary and interstitial irradiation is radiocobalt.

The radioactive properties of radiocobalt make it a highly suitable source for external and interstitital radiation. Flexible radiocobalt wire in nylon threads and radiocobalt needles have been used successfully for interstitial radiation therapy. I have been using radiocobalt beads for intracavitary irradiation for malignancy of the maxillary sinus, the nasopharynx, and the urinary bladder since 1947. The cobalt bead is placed into the central channel of a Foley or a

Fig. 2. Extensive basal cell carcinoma of left cheek, before and after topical P^{32} treatment; 7 years' observation period. Notice the lack of any late radiation skin changes.

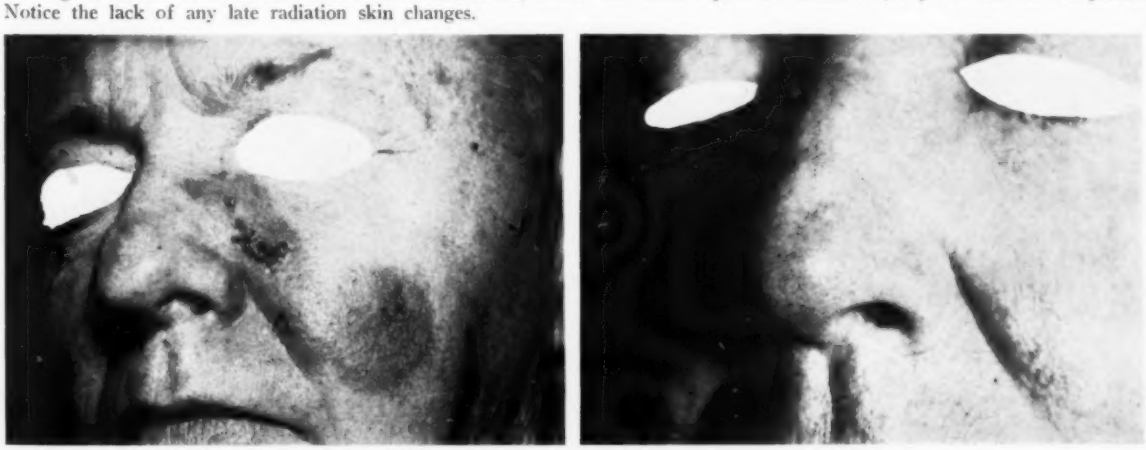


Fig. 3. Pigmented basal cell carcinoma, left side of nose, before and 8 years after treatment. Notice depigmentation and slight atrophy of skin as late radiation change.

Foley-Alcock catheter in such a way that, when the Foley bag is inflated, the bead is in its center. In this manner, an equidistant distribution of radiation is insured, and thus the dose is approximately radially uniform on all surfaces. The deflated Foley bag is inserted into the cavity to be treated, the catheter is then inflated with an iodide solution containing a few drops of methylene blue. From the amount of fluid required to inflate the catheter, the distance between the cobalt bead and the cavity wall can be determined, and the radiation dose can be calculated.

In the treatment of nasopharyngeal and maxillary sinus carcinoma with radiocobalt alone or in conjunction with x-ray irradiation, we have achieved better control of tumors than with x-ray irradiation alone. I do not doubt that similar good results could have been achieved with the proper combination of radium and x-ray treatment.

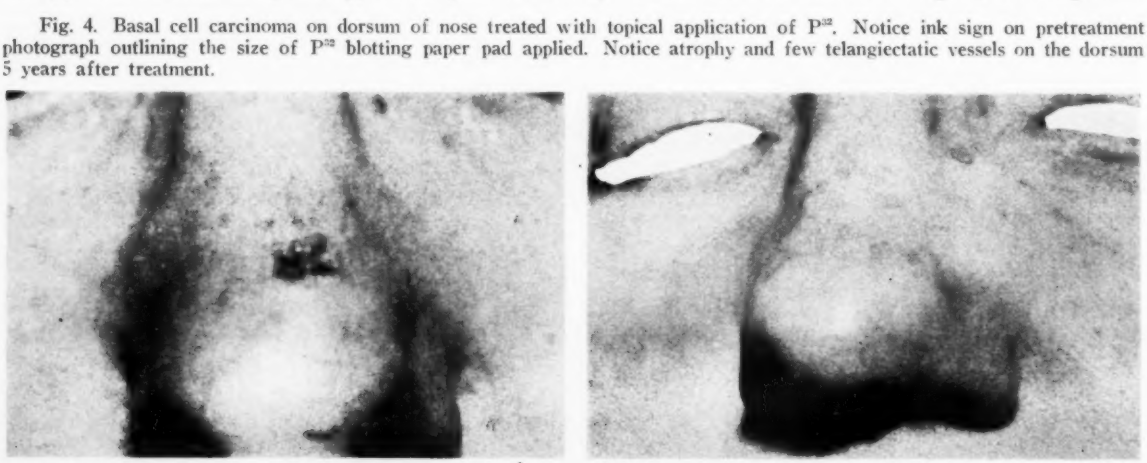
In the treatment of bladder tumors, on the other hand, intravesical radiocobalt application is, in my opinion, superior to any other form of radiation therapy. However, experience so far indicates that intravesical radiocobalt treatment is of avail only in a limited number of cases, particularly in those where the tumor has not invaded the paravesical tissues. For the past 3 years we have extended this treatment method by combining the intracavitary radiocobalt therapy with external x-ray therapy to the paravesical tissues. This method, as you know, has much in common with the well-known and effective combined radium and x-ray treatment of carcinoma of the uterine cervix and uterine body.

Installation of radiocobalt in megacurie units for teletherapy has been very successfully developed. There are one or two units in operation in the United States. Telecobalt therapy has the same advantages as treatment with a two-million volt supervoltage x-ray beam unit.

The use of radioiridium, radiocesium, and other gamma radiator long-lived radioisotopes for teletherapy is similar in effect to equivalent energy x-ray beam units.

Of the internally applied radioisotopes as an eradicative method of therapy, radioiodine has attained great prominence in the treatment of hyperthyroidism. The first experimental attempts to treat hyperthyroidism with radioiodine were reported in 1941. It was not until after World War II, however, that radioiodine therapy of hyperthyroidism became widespread. Apparently several thousand cases have been treated so far, and many hundred have been reported in the literature. Various plans of treatment have been advocated. There is abundant evidence that radioiodine is an effective means of producing a cure in hyperthyroidism, as determined by laboratory methods and by clinical observations. Here again, one important

Fig. 4. Basal cell carcinoma on dorsum of nose treated with topical application of P^{32}. Notice ink sign on pretreatment photograph outlining the size of P^{32} blotting paper pad applied. Notice atrophy and few telangiectatic vessels on the dorsum 5 years after treatment.



factor in successful treatment with I^{131} is the selection of cases. It is now generally accepted that only patients with diffuse hyperplastic glands should be treated. Patients with nodular goiters should not be treated with I^{131}. Whether the use of radioiodine should be limited to patients above the age of 45 because of the theoretical possibility of late malignancy as a result of radiation is a moot question.

I wish to insert a word of caution: Radioiodine was widely adopted for the treatment of hyperthyroidism on the premise that its use would obviate the problems encountered in x-ray therapy. These are, of course, skin erythema, reaction on the laryngeal mucosa, initial exacerbation of disease symptoms, and development of myxedema. With the exception of skin effects, every one of these reactions is known to occur with I^{131} also. However, when x-ray therapy is applied skilfully, these sequelae can be avoided. The results of external radiation therapy of hyperthyroidism compare favorably with the results of any other method of treatment. Also, it must not be forgotten that with radioiodine the whole body is subjected to some radiation, though, with the dosage levels used in the treatment of hyperthyroidism, it must be admitted that no untoward hematologic effects have been observed in patients who have been followed for a 5-year period.

Let me mention an experimental procedure using P^{32} to augment postoperative radiation treatment in cancer of the breast. Most of you will agree that there are few questions in oncology where there is greater diversion in opinions as to management than in that of cancer of the breast. The traditional primary treatment is surgery, or surgery combined with radiation therapy preoperatively or postoperatively. Any of these procedures is limited to the primary tumor and to part of the area of primary spread, that is, some parts of the first line of defense.

The problem in breast cancer, however, is the distant spread; that is, the microscopic distant metastases present at the time of diagnosis or surgery of the primary lesion. Therefore, it appears logical to attempt to destroy any microscopic lesion at the distance at the time when the primary lesion and the first line of defense are treated by surgery or surgery and radiation.

It is known from experience that breast tumor cells concentrate P^{32} differentially in a ratio of 4:1 to 15:1, as compared with normal tissue. It is an experimental fact that P^{32} internally has some beneficial palliative effects on far-advanced cancer. At the University of California Hospital in San Francisco, my colleagues and I came to the conclusion that since P^{32} has some beneficial effects on diffuse carcinomatosis, it might be possible to attack distant microscopic metastatic foci or some "floating" tumor cells by postoperative treatment not only with x-radiation locally, but simultaneously with P^{32} systemically. We argued that by this method of treatment we might salvage more patients than with the conventional methods. We started this treatment experimentally in 1945 and 1946 and treated eight patients with Stages 2 and 3 breast carcinoma postoperatively with P^{32} in conjunction with local roentgen ray treatment. Six of these patients are alive and well at the present time. In 1951 after we had concluded with no untoward effect results from such treatment, we came to the decision to treat all breast cancer cases by combining surgery with postoperative radiation locally and P^{32} systemically.

Although this treatment procedure is still experimental and must be considered as such for some years longer, I have presumed to present this subject to you, nevertheless, because of the challenging nature of our observations so far.

Temporary *arrest* of disease processes has been achieved with systemic use of some radioisotopes.

Radioiodine has proved of value also in some rare instances of thyroid carcinoma. The effect is dependent upon the degree of concentration of radioiodine in the thyroid tumor cells. Only a few forms of thyroid carcinoma do concentrate iodine, and therefore only relatively few forms of thyroid carcinoma are amenable to radioiodine treatment. In general, doses used in the treatment of thyroid carcinoma must be several hundred times larger than those used in hyperthyroidism.

Among the radioisotopes used for *arrest* of a disease, the best established in clinical practice is radiophosphorus. The use of P^{32} in chronic granulocytic and chronic lymphocytic leukemia and polycythemia vera is based on experimental findings that phosphorus is selectively concentrated by bone, bone marrow, leukemic, and neoplastic tissues and that P^{32} in sufficient quantity has a depressing effect on hematopoiesis. In chronic granulocytic leukemia, hematologic remission lasting for several months or even as long as a year is frequently produced with radiophosphorus, and with repeated treatment courses the disease can be held in check for a considerable number of years. Statistical studies have shown that periodic P^{32} treatment results not only in longer survival of the patient, but, what is more important, in maintaining the patient in good and active condition during 90 per cent of his lifetime.

In chronic lymphocytic leukemia, the response to P^{32} in general is similar to that in chronic granulocytic leukemia. However, complete remissions are less frequently seen in chronic lymphocytic leukemia, and the remissions which do occur are of shorter duration for the most part.

Perhaps the most striking results with radiophosphorus have been obtained in the treatment of polycythemia vera. The hematologic response to P^{32} treatment may not be anticipated in polycythemia vera for from 4 to 6 weeks, and it may be delayed as long as 3 months. This latent period is, of course, due to the long life span of erythrocytes and to the fact that less than 0.9 per cent of the red cell volume is replaced daily when the production is normal. Despite the generally good results obtained with radiophosphorus treatment of polycythemia vera, there are a number of patients in whom P^{32} therapy has not been effective. In my opinion, this has less to do with the treatment than with the fact that polycythemia is a complex disease syndrome. Polyglobulia can be the result of a number of disease processes, including even simple stress. How many of these conditions are involved in the production and destruction of red cells is the crucial point in diagnosing such a syndrome as polycythemia vera. The study of iron turnover in any of the polycythemia cases, in addition to blood volume, icteric index, serum bilirubin, and fecal urobilinogen determinations, is imperative to establish the proper diagnosis and employ the proper method of treatment.

The question has been raised as to whether P^{32} is more likely than other forms of therapy to result in the development of leukemia in patients with polycythemia vera. Myelogenous leukemia is known to be a frequent complication in either treated or untreated polycythemia vera. There are many examples in the literature of development of leukemia in polycythemia patients whose only treatment was phenylhydrazine, Fowler's solution, or venesection. A more reasonable explanation of incidence of leukemia in polycythemia patients who have been treated with P^{32} is that any polycythemia patient who does not succumb to cardiovascular accident or disease will terminate in leukemia. Radiophosphorus produces longer and more complete remissions of polycythemia vera than other forms of treatment and so prolongs the life of the patient. This may result in the incidence of more deaths from leukemia as a natural terminal development of the disease, wholly unrelated to treatment with P^{32}.

Temporary *palliation* of disease symptoms has been achieved with some radioisotopes. Colloidal radiogold and chromic radiophosphate are worthy of mention. Radiogold is sometimes effective in diminishing the rate of production of ascitic and pleural fluid in carcinomatosis. Similar effect can be achieved with chromic phosphate. However, the effect is temporary only, and we have experienced intestinal obstruction as a complication in three of the sixteen patients treated.

Radiogold and chromic radiophosphate, given intravenously, have proved of value in hepatomegaly and splenomegaly, in advanced leukemia, and in polycythemia vera, particularly when bone marrow hypoplasia was prominent and prohibitive of total body internal or external irradiation.

In conclusion, it is my hope that in this brief review of the clinical uses of radioisotopes, I have been able to show that artificial radioisotopes have an established place in clinical medicine. No longer may we think of them simply as a means of experimentation. It would be quite wrong, however, to suppose that in the radioisotopes we have found the answer to all our diagnostic and therapeutic problems. Rather, through proper understanding of their nature and their biologic effects, which subjects are the particular province of the radiologist, radioisotopes may increasingly take their place as one important tool among the various radiation tools which the radiologist already has at his disposal.

Medical Aspects of the Atomic Explosion

W. KENNETH RILAND, D.O.
New York City

Editor's Note: This article comprises Lectures IV to IX and the examinations used by Dr. Riland in 1951 for civilian defense training of employees of the United States Steel Corporation. The introduction and first three lectures were published in the November JOURNAL. *They are published in* THE JOURNAL *because they are basic to such training even though some changes in approach have been effected since the time the training course was organized. While the course was organized by Dr. Riland for training employees of a single company over whom he could exercise greater control than is generally possible in civil defense training programs, it will be applicable by other osteopathic physicians directing preparation for catastrophic situations. Situations of such nature may arise from causes other than the atomic bomb.*

LECTURE IV

FRACTURES

The problem of treatment of fractures resulting from atomic bomb explosion is greatly intensified by the tremendous forces released. As I have stressed in past lectures, all types of injuries can and will be found in one person. Also all types and degrees of fractures can and will be found in one individual, and our approach to treatment is thereby modified. There will be too much to do to maintain life immediately following an explosion to allow immediate treatment of fractures. Nevertheless, they must be treated, and some policy for immediate handling of fracture cases must be outlined. Frankly and honestly, the less done the better—the less examination, the less moving, and the less splinting, the better the end result. A good working knowledge of anatomy and physiology will form the basis of intelligent initial care for fracture cases.

As you will recall, in the second lecture devoted to anatomy and physiology, I stated that bone has the function of supporting and proctecting structure, of giving form and a degree of rigidity, and at the same time providing for motion. A fracture is a break in the normal contour of the bony supporting structure of the body. The vast majority of bones are protected by muscles, ligaments, and finally skin. This is true in almost all areas of the body except the skull. Fractures are caused (at least those that we are concerned with) by excessive force transmitted to the bony supporting structure. This external force causes damage to the skin and the structures beneath before reaching the bone. This damage which is known as soft tissue damage is always present in a fracture. Nerves can be torn, blood vessels separated, and muscles injured by the force alone. Also these structures can be and are injured in another manner—the fractured bone often presents one or more jagged edges which are forced through muscle bodies severing blood vessels, crushing and severing nerves, and even protruding through the skin. Breaking through of the skin creates an additional wound which grossly enlarges the possibility of hemorrhage and infection.

Classification of Fractures.—
Simple: Fracture of bone without breaking the skin
Compound—Fracture of bone with break through the skin

Type of Fractures.—Fractures may be transverse, oblique, comminuted, greenstick, spiral, or fissure. All types can be either simple or compound, with the possible exception of the fissure type.

A bone may be broken by (1) Direct violence (break occurs at the site of the application of force); (2) indirect violence (break occurs at a distance from the application of force—for example, a foot caught and twisted may cause a break in the bone of the lower leg); (3) powerful muscular contraction (for example—electric shock therapy for mental disorders may cause multiple fractures by inducing intense contractions).

Manifestations of Fracture.—Signs are not always present, but the enormity of the blast factor of atomic explosion can cause a multiplicity of them, including (1) pain and local tenderness, (2) loss of the use of the affected bone, (3) grating noise, (4) swelling, and (5) abnormal mobility. Items

(3) and (5) serve no diagnostic purpose for motion is necessary to determine whether or not these signs are present, and movement of fractured areas is not to be attempted.

Treatment.—The procedure established for our group is as follows:

1. Determine the problem.
2. Control hemorrhage.
3. Treat for shock and pain.
4. Do not attempt to disturb or move fractured areas until you have found what support is required. Unless the person is in a dangerous area and where additional injuries are likely if he is not moved *let him remain* where he is.
5. If the injured person cannot be made to lie still, and there is danger that his movements will increase his injuries, a temporary splint should be applied.
6. The time to apply maintenance splint therapy is after the most serious casualties have been attended and assistance has been secured. These splints will remain in place until the patient is examined by the medical staff and/or removed to a casualty center.

Specific Fractures.—

Spinal Fractures: Fractures of the spine, from the point of view of the recipient's future, are unquestionably the most serious fractures with which we will contend. Extreme care must be exercised in the initial treatment in order to avoid severance of the spinal cord which could result in partial or total paralysis. Any injured person unable to move or feel either extremity must be considered, temporarily at least, as having sustained a spinal fracture. In these cases:

1. Do not permit the injured person to assume or attempt to assume a sitting position.
2. Do not move the injured in any manner which permits the spine to flex. The injured should be kept lying face down, but if he should be face up, something should be placed under the back to put the spine in hyperextension. If the neck has also been fractured, the head should not be raised and support must be placed on either side of the head to prevent rotation.

Fracture of the Pelvis: The pelvis is made up of three bones, the two hip or pelvic bones and the sacrum, which is the base of the spine. Fracture of this structure is dangerous because of the closeness of the abdominal organs, including the bowels, and large blood vessels. There is usually acute pain in connection with such injuries, and severe shock is always present. The injured must not be moved without firm support and must be kept in a reclining position; they are treated essentially the same as those with fracture of the spine.

Rib Fractures: Fracture of the ribs endangers life only when a fragment displaced by force punctures the lung or where respiratory efforts induce puncture of the lungs.

Coughing up of bright red blood, frothy in nature, is usually indicative of lung puncture. Treatment of this condition is essentially supportive, that is, the patient should be treated for shock and kept as quiet as possible. Place the patient upon a firm support and avoid handling of the rib cage. These patients require experienced care and should be placed first upon the list for removal to medical staff or casualty center.

Dislocations.—Displacement of one bone upon another at a joint is called a dislocation. In order for a dislocation to take place the ligaments and the cover, or capsule, of the joint must be torn. The symptoms are the same as for fracture and the treatment is also the same. Do not attempt to reduce dislocations. Support these injuries as a fracture with splints.

Treatment of Compound Fractures.—Before any attempt is made to splint a compound fracture, the open wound must be treated.

1. Hemorrhage must be controlled by compression or tourniquet. Proper installation of the tourniquet must be checked by noting pulsation in the affected member. In the leg, for example, the pulse must be checked below the site of tourniquet, at the top or on the inner side of ankle, behind the knee, or in the groin. If pulse is noted below tourniquet, sufficient pressure has not been applied. The time of application must be noted and after 20 minutes, it must be released for several minutes, no matter how severe the hemorrhage.
2. 600,000 units of penicillin are injected into the buttocks.
3. Shock therapy is started by giving 1,000 cc. of normal saline solution intravenously.
4. Tincture Metaphen is instilled into the wound.
5. The wound is covered with sterile pads.
6. Splinting can then be undertaken.

LECTURE V

RADIATION SICKNESS

A brief review of the hazards which can be encountered as a result of nuclear fission as applied to warfare may be of value and, I believe, is in order. As you will recall, the atomic bomb can cause casualties by three principal means: *blast, thermal radiation,* and *radioactivity.* Each of these phenomena is distinct, but it must be remembered that any combination of these three manifestations can and will occur in one individual. As we go on we will be better equipped mentally to make an analysis of the relative importance of each under various conditions of atomic bomb attack related to air, ground, or underwater burst.

A realistic estimate of the number of casualties that might occur cannot be made because too many variable factors are involved, such as the type of burst, the type of building construction, the season of the year, and the time of the day. The time of day, for instance, is most important, particularly in New York City, because of the wide variation in distribution of population in working hours and nonworking hours.

Radiation.—Radiation is a form of energy that causes injury to tissues by a process of ionization. Therefore, we must understand what is meant by ionization without becoming enmeshed in the realms of biophysics.

Ionization is simply the process of the displacement of an electron from its orbit in the atom, thus leaving the remainder of the atom positively charged. When this process takes place within the cells of the human body it causes an injury from which the cell may: (a) recover without impairment of function, (b) recover with permanent impairment of function, or (c) die.

The various tissues of the body vary in their susceptibility to ionizing radiation. The most sensitive are the white cells of the blood, lymphatic tissue, and some of the cells of the bones; the least sensitive are the nerves.

As you will recall, nuclear fission liberates various types of radiations which vary in their ability to cause ionization. The *alpha* particle can ionize but it is not important for our consideration because of its limited penetrating ability. The *gamma ray,* however, has a tissue-penetrating ability of 10,000 to 1 over that of the *alpha* particle. Since the *alpha* particle is unable to penetrate the horny, or tough, layer of the skin it is relatively unimportant, except that it can be a hazard if it is introduced into the body through wounds; then it can penetrate the delicate tissues of the organs. We can, for our purposes, consider the *neutron* and the *gamma ray* on the same basis, with only one important difference—the greater range of the *gamma ray.* Also we may consider the *alpha* and *beta rays* as being virtually identical.

It may be of interest here to talk for a moment about the effects of super A-bombs or the hydrogen bomb. The increase in the size of the bomb does not increase the destructive force in direct proportion. For example, to obtain a blast damage radius twice as great as that of the Nagasaki bomb would require a bomb eight times as powerful as the A-bomb, since the blast effect is increased by the cube root of the energy, and 2 is the cube root of 8. Neither are heat and radiation effects in direct proportion, but in the proportion of the square root.

Pathologic Effects of Radiation on the Body Systems.—Before considering the effects of radiation upon the various systems of the body, it should be called to attention that there is an important relationship between radiation effects and the time of death. In Japan among those dying within the first 2 weeks there were few, if any, symptoms of the involvement of any of the body systems before death. In the group dying from the third to sixth week, ulcers and hemorrhages were common symptoms and the general nutrition was markedly poor; epilation was at its peak. Those dying in 3 to 4 months

improved so far as epilation was concerned and showed retrogression of intestinal symptoms, including the marked malnutrition.

Skin: Pigmentation, epilation, reduction of the number of sweat glands, and thickening are the chief involvements of the skin, and we must remember that some of the normal functions of the skin, as presented in past lectures, are reduced or eliminated by these changes.

Heart: The principal changes are hemorrhages and some increase in fluids within the heart muscles. After the second month, no definite changes in heart functions were noticed in the Japanese victims.

Lung: No essential damage was noted, but as a result of secondary infections, hemorrhagic pneumonia was common.

Genitourinary System: Except for hemorrhage of a minor character, no definite damage to the kidneys or ureters was noticed. Some ulcers were found in the bladder, but they were not serious.

The testicles showed intense changes which were noted in every cadaver examined. The major change was widespread damage to all testicular tissue and halting of production of sperm cells. Sufficient time has not elapsed to reveal whether or not this condition is permanent.

The changes of the female were much less acute. The absence of live germ cells was rare. Cessation of menstrual activity, a significant number of abnormal births, and an increased death rate of mothers was noted in Nagasaki. The increased death rate may have been caused by nutritional deficiencies rather than the effect of atomic radiation upon the process of birth.

Gastrointestinal Tract: This system was one of the first to show signs of damage. The intestinal tract was swollen, and widespread hemorrhage was evident. Deep ulcers were present at various sites of hemorrhage. Thickening of the intestinal wall with noticeable decrease in its power of absorption was noted. The normal intestinal bacteria were increased while the defensive mechanism of the intestines was decreased. The condition was almost identical to bacillary dysentery.

Lymphatic Tissue: Lymph nodes, tonsillar tissue, et cetera showed the highest sensitivity to ionizing radiations; as early as the third day atrophy was noted. These tissues constitute the chief defensive system of the body, and their deterioration provides the answer to the susceptibility of ionized patients to infection. Involvement of these tissues leads to necrotic areas of the tongue, tonsils, larynx, and gums; hemorrhagic pneumonia; hemorrhage of gastrointestinal tract, et cetera.

Miscellaneous Structures: Only minor hemorrhages or slightly necrotic changes were noted in the brain. No changes were noted in the pancreas. The effect upon the liver has been highly debated.

Treatment.—The treatment of radiation sickness, at present, is essentially supportive and preventive—preventive in the sense of the prevention of secondary infections.

Supportive Phase: Treatment in the supportive phase is directed to the restoration of fluid loss caused by hemorrhage, retention of fluid in the cellular structure from the effects of massive shock, and resulting from the effect of the ionization itself. It is not practicable to store whole blood, which is the ideal treatment for this phase of radiation sickness. Our substitute for whole blood is normal saline solution which admittedly is a temporary supplement, but it is sufficient in most cases to maintain life until whole blood transfusions are available. If drinking water is available and the condition of the injured person enables him to drink, copious amounts of salt water by mouth should supplement the intravenous introduction of normal saline solution.

Preventive Phase: The preventive phase of treatment is directed at secondary infections; it attempts to overcome the lack of defensive ability of the body, resulting from the high sensitivity of the white cells and lymphatic system to ionization. Intramuscular injection of 600,000 units of penicillin is the safest and easiest method of helping prevent widespread infection of the body by organisms already contained therein and those organisms introduced by the secondary effects of the explosion.

Summary.—As you remember, at the beginning of this lecture, I mentioned the time factor as being important. All of the symptoms, damage, and effects discussed above are modified or increased by length of exposure, dosage, and the area of the body exposed.

LECTURE VI

INTRAVENOUS SALINE INJECTION (VENOCLYSIS)

The following are the steps to be taken in intravenous administration of normal saline solution.

1. Apply tourniquet.
2. Cleanse injection site with Tincture Metaphen.
3. Remove Venopac from box.
4. Take *black* safety cap from bottle.
5. Loosen cap of bottle—*do not remove.*
6. Remove large *red rubber cap* from large end of Venopac.
7. Remove cap from bottle and in the same motion attach black end of Venopac to the bottle, by twisting the bottle, *not* the Venopac.
8. Close clamp.
9. Invert and suspend the bottle as high as possible above the injured.
10. Remove the blue cap from the small end of the tubing and attach the needle at once.
11. Open the clamp and allow solution to flow out of the needle for the count of *ten*—then close clamp tight.
12. Shake needle hard 3 or 4 times.
13. Insert needle into vein you have selected, watching for blood to show at the end of the tubing close to the butt of the needle. This indicates that you are in the vein.
14. Tape needle end of set securely to injured.
15. Remove tourniquet.
16. Open clamp and allow solution to flow.
17. Adjust rate of flow by sliding clamp until you can count from 40 to 60 drops per minute through the glass tube at the neck of the bottle.
18. If after the set has been working properly it suddenly stops, as indicated by a cessation of drops, check the following points in the order given:
    a. Release the clamp to increase the rate of flow.
    b. Rotate the shaft of the needle, but do not remove.
    c. Remove the small metal nipple from the base of the bottle.

LECTURE VII

TRAUMATIC INJURIES

In past lectures I have stressed repeatedly the multiplicity of injuries which will be found as the result of an atomic explosion. The type of wounds sustained will be determined by the type of violence. The location of the injured at the time of explosion will, to a degree, determine the type of wounds. For example, let us consider several locations in our building and attempt, as far as possible, to imagine the types of injuries which might be expected.

Suppose Mr. X is sitting at his desk on the first floor 10 feet from a window. Mr. X, if not alert and not obeying training instructions on how to take cover, will suffer, initially, massive and multiple lacerations to all exposed body areas from glass, and, secondly, crushing injuries from heavy objects thrown about as a result of the blast, burns, et cetera.

Now let us take Mr. Y, a member of the building staff, who is in the cellar. As a result of the explosion, a piece of cornice is blasted off the roof of a building and plunges through the metal hatchway on the sidewalk, entering the cellar. En route it shears off the 4-inch water main, flooding the cellar area and shorting the main switchboard of the building. Mr. Y, unable to protect himself, is thrown by the force against the metal guard of the switchboard, receiving spinal fractures, and multiple burns as a result of the shorting flash.

These two examples, I hope, will tend to illustrate the problems which you will face as a result of your particular location in the building. It would be of great value if each

floor unit gave some though and imagination to the physical problems of your respective areas, for an understanding of what you may face could materially reduce your casualty problems.

Wounds.—The wounds of atomic explosion can be likened to those received in actual warfare and no doubt will contain deeply buried fragments.

Wounds are classified into two major groups—*contused (or closed)* and *open wounds.*

Contused Wounds: This type results from the impact of blunt objects, usually large, which do not penetrate the skin but crush the tissues beneath the skin. If you will recall the discussion of soft tissue damage in the lecture on fractures, you can visualize the mechanism of contused wounds, remembering that any area, or organ of the body, can be subjected to contusion.

Open Wounds: This type is defined as that in which the skin is lacerated or torn, exposing the tissue beneath. Open wounds are subdivided into:

1. Abrasions—scratches of the skin surface which do not penetrate all skin layers.
2. Incised wounds—those made by sharp objects severing all skin layers but leaving smooth skin edges. These wounds can be deep, with severed blood vessels and nerves and penetration of organs.
3. Lacerated wounds—those inflicted by a semiblunt object sufficiently sharp to tear the tissues and leave ragged edges.
4. Penetrating or puncture wounds—those made by a sharp object entering the body, usually through a small portal of entry.

Effects of Wounds.—As a rule contused wounds do not provide an entry for infection. Nevertheless, wounds of this type are often fatal when delivered to specific areas of the body. Contused wounds of the heart can seriously alter its functional ability and can stop its action. Contusion of the brain can cause death.

Open wounds can result in death by hemorrhage or infection. The infections arising from open wounds are chiefly caused by streptococci, staphylococci, and colon, tetanus, and gas bacilli.

Wounds of Special Structures.—

Scalp: Wounds of the scalp are not particularly serious, except that fractures of the skull are frequently found in conjunction with scalp wounds. The scalp is richly supplied with blood vessels and hemorrhage is often massive. Great care must be exercised in scalp wounds to determine extent of damage to the skull. Control of bleeding is done by pressure but never at site of wound.

Skull and Brain: The skull is not important except as a container for the brain and fractures of the bones of the skull, inasmuch as these bones carry no weight, are unimportant except for depressed fractures. Injuries to the skull may allow the escape of cerebral fluid, especially from the ears and nose. Leakage of this watery fluid is sometimes massive, a quart or more a day. Treatment in the case of leakage by ear consists of placing the injured person upon the side of drainage and allowing the fluid to drain into sterile pans. In the case of leakage by the nose, place the injured in a comfortable position to facilitate drainage. Never try to control the discharge. If an object is penetrating the skull, do not remove the object; take precautions to prevent further entrance, control hemorrhage, and combat infection. Remember that the cells of the brain have no healing power; not one cell, if destroyed, can be replaced. Therefore, all persons with brain injury or suspected injury must be handled gently.

Observations should be made as to: (1) pupil size and equality, and (2) which side of the body is paralyzed. Note if paralysis develops later.

Treatment of Skull and Brain Injury: (1) Place patient in prone position, with face to one side. (2) Do not give morphine. (3) Treat for shock. (4) Administer penicillin. (5) Treat the patient the same as a patient with a spinal injury. (6) Move by litter. (7) There is no necessity for immediate removal.

Mouth, Face, and Neck:

Contused wounds require little if any care, but they are an indication to look for fractures within the area.

Open wounds require immediate care. Hemorrhage must be controlled by pressure. If the injured patient is unconscious, his position must be such as to prevent the aspiration of blood into the lungs. Dentures and other foreign bodies must be removed in wounds of this area. Respiration must be maintained, and wounds of this area often complicate respiratory efforts. It may be necessary to employ heroic measures to insure a clear air passage as a few seconds may mean the difference between life and death. Cleanliness of materials or hands is not important at the moment. In order to keep the respiratory tract free and clear it may be necessary to put a safety pin through the end of the tongue in order to tie it in a safe position with a strip of bandage.

Injuries of the Chest: Injuries of the chest are of significance because of their influence upon the vital functions of respiration and circulation. Suspension of either of these functions for any length of time is incompatible with life.

The chest consists of a bony cage made up of the ribs joined together anteriorly by the sternum and articulating posteriorly with the dorsal spine. Beneath each rib are the intercostal nerves, arteries, and veins. In addition the entire chest cage is encased in muscle tissue necessary for support and to provide the action of respiration. The bottom of the chest contains a dome shaped muscular organ, the diaphragm, which separates the chest and abdomen and is very important for the respiratory function. The chest contains the right and left lung, bronchial tree, trachea, and heart.

There is one important fact with which you all must become familiar in order to understand the importance of chest injuries. The chest is divided into right and left pleural cavities containing the right and left lung respectively. The pressure within the lungs is greater than the pressure about the pleura which contains the lungs. This fact allows for the normal expansion of the lung structure. Any opening of the chest wall increases the pressure upon the pleura, which upon expiration pressure collapses the lung. This is the basis for a sucking wound, so called by reason of the sound it makes. These wounds demand immediate treatment which must be directed to blocking the entrance of air into the chest cavity. Increased pressure and hemorrhage or either of these conditions singly exert a dangerous influence upon normal heart action.

Symptoms of Chest Injuries: Chest injuries often are a combination of conditions. The outstanding signs to watch for are:

1. Difficult respiration.
2. Hemorrhage from chest wall.
3. Bleeding from lung.
4. Massive shock.
5. Sucking wounds.

Most chest injuries are complicated and serious, and persons with these injuries stand second on the list for priority of treatment.

Treatment of Chest Wounds:

1. Sucking wounds—they require immediate occlusive bandage and turning injured person to uninjured side to give greater freedom of motion to injured side.
2. Morphine.
3. Shock therapy.
4. Penicillin.
5. Second priority for removal.

Injuries of the Abdomen: Although the subject of anatomy was stressed in a previous lecture, it is in order to review in a general manner the anatomy of the abdomen. The vault of the abdomen is made up of the diaphragm, the bony pelvis, the anterior wall musculature which varies in strength from individual to individual, and the posterior wall made up of the lower ribs, the dorsal and lumbar spine, and the heavy muscles of the back. The abdomen contains two types of organs: the solid, as the liver, spleen, kidneys, and pancreas; and the hollow, as the stomach, intestines, and urinary bladder. The solid organs vary very little in size

from time to time, but the hollow organs change their size and shape under various conditions. Hollow organs enlarge and become distended after eating, and this distention makes these organs more liable to injury.

Abdominal injuries are classified as nonpenetrating or penetrating. The nonpenetrating injury is being seen with increasing frequency in everyday life and we must remember that the blast of atomic explosion is likely to cause the nonpepetrating type. Wounds produced by flying glass, wood splinters, masonry, et cetera can cause penetrating wounds with openings large enough to allow protrusion of the intestinal tract. We must also remember that a combination of abdominal and thoracic wounds can occur. The constant study of anatomy will afford the best possible training for the handling of thoracic as well as abdominal cases. In severe crushing injuries, such as are received by being buried under debris, abdominal injuries are frequently seen. All people so buried must be considered as having been subjected to some form or degree of abdominal injury.

Symptoms of Abdominal Injuries:
1. Severe pain—not too severe at first.
2. Muscle spasm.
3. Nausea and vomiting.
4. Massive shock.
5. Localized tenderness.

Treatment of Abdominal Injuries:
1. Apply simple massive bandage.
   a. Do not replace viscera.
   b. Do not remove foreign bodies.
   c. Do not explore wound.
2. Administer morphine.
3. Treat for shock.
4. Give nothing by mouth.
5. Do not remove except on litter.
6. Injuries of this type stand fourth on list for priority of removal.

LECTURE VIII

TREATMENT OUTLINE AND PRIORITIES*

Priorities in Treatment and Transportation to 13th Floor.—
1. Massive hemorrhage
2. Chest wounds
3. Massive shock
4. Abdominal wounds
5. Burn and crush injuries
6. Head and spine injuries

Treatment.—
1. Tag
   a. Slightly wounded
   b. Seriously wounded
   c. Mortally wounded
2. Foreign bodies
   Leave alone.
3. Hemorrhage
   Use tourniquet only when pressure is inadvisable or impossible.
4. Wounds
   Cut away clothing and apply Tincture Metaphen and sterile covering; otherwise leave alone.
5. Morphine
   Note time and dose on tag. Avoid in unconsious patients or those with brain injury. Avoid repetition in shock.

Treatment of Specific Conditions.—

Hemorrhage:
1. Apply pressure
2. Elevate part when possible
3. Use tourniquet only if hemorrhage is uncontrollable with pressure
4. Administer morphine
5. Treat shock—using normal saline solution intravenously
6. First priority for removal

Chest Wounds:
1. Sucking wound—occlusive dressing
2. Shock—normal saline solution intravenously
3. Morphine
4. First priority for removal

Abdominal Wounds:
1. Apply massive disposable diaper dressing
2. *Do Not*
   a. Replace viscera
   b. Remove foreign bodies
   c. Manipulate or explore wound
3. Treat shock
4. Administer morphine
5. Give nothing by mouth
6. Priority for removal after hemorrhage, chest wounds, and massive shock—before head or spine wounds and burns

Crush Injuries:
1. Control hemorrhage if present
2. Treat shock—using normal saline solution intravenously
3. Administer morphine
4. Keep patient supine
5. Immobilize fractures if present
6. Priority for removal—fifth, but before burns

Brain and Spinal Injuries:
1. If in doubt, treat as spinal injury
2. Place patient in prone position
3. Use slight padding under chest
4. Immobilize to litter
5. Give *no* morphine, except for *extreme* restlessness
6. Last in order of priority for removal

Massive Wounds of Extremities: Treat as outlined—remove only if hemorrhage is uncontrollable, in which case, use tourniquet while immobilizing fractures, et cetera. In case of uncontrollable hemorrhage, case becomes first priority—otherwise lesser priority.

*Based upon chart prepared by M. J. Healy, Jr., M.D., F.A.C.S., for Medical Emergency Division, Office of Civil Defense, City of New York.

LECTURE IX

NERVE GAS PROBLEMS

In the words of Col. John R. Wood of the Army Medical Corps, the outstanding authority on chemical warfare, "The nerve gases were first developed by the Germans, but are now well known to both our allies and our potential enemies."

The nerve gases, organic phosphate compounds, are a group of chemicals having the property of irreversibly inhibiting the *enzyme, cholinesterase.* They are colorless, essentially odorless liquids, which yield toxic vapors on evaporation. They are more toxic than previously known chemical agents used in warfare, and they may gain entrance into the body by inhalation or absorption through the skin, eyes, or gastrointestinal tract. It is interesting to note that some of these organic phosphate compounds are in use as agricultural insecticides, for example, Parathion, Di-Isopropyl-Fluorophosphate, and Tetraethyl Pyrophosphate, but they are not as toxic as the compounds used in nerve gas.

As you will recall, in the first lecture I outlined, in a general manner, the pathologic physiology of this toxin upon the nervous system. Let us now review the effect for a better understanding of the approach to treatment.

The inactivation of *cholinesterase* allows an accumulation of *acetycholine* within the nervous system. The acetylcholine normally transmits the nerve impulse from the nerve endings or motor end plates, as they are called, to the muscles, causing contracture. The cholinesterase then inhibits this influence ending the muscular contraction. The introduction of the nerve gas toxin inactivates this function of cholinesterase, thus producing uncontrollable contracture which rapidly leads to flaccid paralysis.

Exposure to traces or small doses of this toxin causes pinpoint constriction of the pupils within a few minutes, ac-

companied by a mild constriction of the bronchi, and a watery nasal discharge. Pain on attempts to focus the eyes and a drawing sensation or pain in or in back of the eyeballs result. Pain next radiates to the base of the skull and to the frontal area. It is often accompanied by inability to look at normal light rays. These small doses do not produce respiratory difficulties of any lasting nature, and such difficulties as are caused are relieved by small doses of atropine sulfate, a potent and dangerous drug. The effects of nerve gas make it possible to use greater doses of atropine sulfate than a normal person could stand. The effects of the toxin upon the eyes and the headaches which result from small doses of the poison are more lasting than the effects upon respiration; they require repeated instillation of atropine ophthalmic ointment.

The inhalation of larger doses of vapor or the absorption of liquid gas by other routes causes a rapid and severe bronchial spasm which obstructs both inhalation and exhalation. The victim rapidly becomes confused and cyanotic, has nausea and vomiting, and soon becomes unconscious. The blood pressure falls to shock level and the heart rate decreases rapidly which may lead to the arrest of heart function.

Large doses (2 mg.) of atropine sulfate, if given immediately, may reverse this combination of respiratory and heart dysfunction; the bronchial tree relaxes, and the heart regains its normal rhythm. In these cases it is essential that the antidote be given as rapidly as possible; intravenous introduction is best, but intramuscular will suffice if the patient is not in shock. The unit dose of atropine sulfate should be given every few minutes until the heart and respiratory symptoms are relieved. After the acute phase is over, doses must be administered for several days at intervals of 3 to 4 hours, depending upon symptoms, since the effect of the poisoning is more persistent than the effects of the atropine. The installation of ophthalmic atropine ointment is also indicated in these severe cases.

If the severely affected patient is not treated promptly, profuse salivation, intestinal hypermotility, and spasm are noted and loss of control over urine and feces follows. The increasing accumulation of acetycholine leads from intermittent to continuous spasm and then to flaccid paralysis.

The advent of flaccid paralysis brings with it the problem of maintenance of respiration by manual means. The well-known Schafer method of artificial respiration is ineffective. The chest is flaccid and collapsed and all action of the diaphragm is lost. A new method suggested by Emerson is worth a trial. As yet, no real measure of its effectiveness is available, but we must of necessity incorporate this method in our procedure.

The patient is placed in the prone position. The operator straddles the patient, grasping the thighs at the level of the pubes and alternately lifts and lowers the hips 10 to 12 inches. The indications are that this method will effectively ventilate the lungs in cases of flaccid paralysis of the respiratory muscles.

If the skin is splashed with nerve gas, it is important to remove it as soon as possible. Included in your gas kits are spray bottles of sodium carbonate, 5 per cent, which is to be used for decontamination. Swabbing or rubbing the skin with dry materials must be avoided. Clothing splashed with liquid nerve gas must be removed. No victim must be allowed in safe areas until decontamination is completed.

Members of gas teams are provided with the following items:

1. Gas mask
2. Thin surgical rubber gloves
3. Heavy rubber gloves
4. Rubber apron
5. Rubbers for shoes
6. Ampins of atropine sulfate (2 mgs.)
7. Cotton
8. Sterile pads
9. Box of wipettes
10. Casualty tags
11. Indelible pencil
12. Sodium carbonate, 5 per cent.

EXAMINATION

PART I

Name .....

Company .....

Floor .....

Room .....

Telephone Extension .....

Give single word answers if possible, except when more are necessitated by form of question. When you are called to demonstrate functions and use of syringe, venoclysis, and fracture splinting, please bring this examination paper with you.

1. List the 3 factors of atomic explosion.
   (1)..... (2)..... (3).....
2. What percentage of injuries has it been estimated will be due to the blast effect?.....
3. How many feet of rubble is it estimated will fill the streets of downtown New York?.....
4. How much heat is liberated at the point of explosion of an atomic bomb?.....
5. Does thermal (heat) radiation have a high or low degree of penetration?.....
6. List 4 reasons why clothing has a protective effect against thermal radiation.
   (1)..... (2)..... (3)..... (4).....
7. Why is residual radiation in an air blast of an atomic bomb not important?.....
8. Why is residual radiation in an underwater blast of an atomic bomb important?.....
9. Do the gamma rays have a high or low penetrating power? .....
10. From a medical standpoint, what is the problem presented by nuclear radiation?.....
11. Name 3 avenues through which the gamma rays may enter the body.
    (1)..... (2)..... (3).....
12. What does the symbol "r" stand for?.....
    .....
13. How many r's constitute
    (a) Lethal dose.....(b) Medium Lethal dose.....
    (c) Moderate dose.....
14. List 5 of the 7 systems of the body.
    (1)..... (2)..... (3).....
    (4)..... (5).....
15. List 3 functions of bones.
    (1)..... (2)..... (3).....
16. List 2 types of muscles.
    (1)..... (2).....
17. What is the smallest unit of the body?.....
    Give its 5 functions. (1)..... (2).....
    (3)..... (4)..... (5).....
18. What are 2 functions of the circulatory system?
    (1) ..... (2).....
19. List 3 parts of the circulatory system.
    (1)..... (2)..... (3).....
20. What determines blood pressure?
    (a)..... (b)..... (c).....
21. Give 3 types of blood vessels.
    (1)..... (2)..... (3).....
22. List the organs of the digestive system from one end to the other. .....
23. Name an important function of the liver.....
24. What is the connection between the kidneys and the bladder? .....
25. What is the function of the nervous system?.....
26. Name two divisions of the nervous system.
    (1)..... (2).....
27. Give one function of each division of the nervous system.
    (a)..... (b).....
28. Upon what basis are burns classified?.....
29. In the following table of Berkow's used as an aid in determining the prognosis of a burned individual, fill

in the correct percentages.
(a) Lower extremities, including buttocks....% (c) Upper extremities.....%
(b) Neck and trunk.....% (d) Head .....%

30. List 4 functions of the skin.
(1)..... (2)..... (3)..... (4).....
31. Outline the symptoms of shock.
(1)..... (2)..... (3).....
(4)..... (5).....
32. Name 3 considerations to be observed in the evaluation of a burned patient.
(1)..... (2).....
(3).....
33. List the first 5 steps in our treatment procedure for burns.
(1)..... (2)..... (3).....
(4)..... (5).....
34. Give 8 symptoms of nerve gas.
(1)..... (2)..... (3).....
(4)..... (5)..... (6).....
(7)..... (8).....
35. What is the antidote for nerve gas?.....
36. What is the function of the kidneys?
(1)..... (2)..... (3).....
37. What is the location of the kidneys? Illustrate by diagram.*
38. Give treatment of shock.
(1)..... (2)..... (3).....
(4)..... (5).....

PRACTICAL EXAMINATION

Examined by Remarks

1. Syringe
2. Venoclysis
3. Splint
4. Pressure points

EXAMINATION

PART II

1. List 5 symptoms of fracture and underline 2 which cannot be used to establish a diagnosis.
(1)..... (2)..... (3).....
(4)..... (5).....
2. Give 2 classifications of fractures and describe each.
(1) .....
(2) .....
3. List 6 steps in treatment of compound fractures.
(1)..... (2)..... (3).....
(4)..... (5)..... (6).....
4. Describe test to determine if tourniquet has been applied correctly and with sufficient pressure.
.....
5. State as simply as possible your impression of the process of ionization; base your statement upon the effect upon a single atom in the human body.
.....
6. List 6 symptoms of radiation sickness appearing in first week after exposure to a lethal dose.
(1)..... (2)..... (3).....
(4)..... (5)..... (6).....
7. What tissue of the body is most susceptible to ionization?
.....
8. Give 2 classifications of wounds.
(1)..... (2) .....
9. Give 4 divisions of open wounds.
(1)..... (2)..... (3)..... (4).....
10. How could a closed wound cause an infection?.....
11. Why must great care be exercised in scalp wounds?.....
12. In a puncture wound, should object protruding be removed?.....
13. List 3 observations to be made in suspected brain injury.
(1)..... (2)..... (3).....
14. Why are chest wounds of major significance?.....
15. Briefly describe the effect of a puncture wound of the chest upon respiratory function.....
16. By drawing, illustrate organs within the chest and their correct location.*
17. List 5 signs of chest wounds.
(1)..... (2)..... (3).....
(4)..... (5).....
18. List 5 steps in treatment of chest wounds (sucking type).
(1)..... (2)..... (3).....
(4)..... (5).....
19. By drawing, illustrate organs within the abdomen and their correct location.*
20. List 3 solid organs of the abdomen.
(1)..... (2)..... (3).....
21. List 2 hollow organs of abdomen.
(1)..... (2).....
22. What is difference, as far as injuries are concerned, between solid and hollow organs?.....
23. Give 2 classifications of abdominal wounds.
(1)..... (2).....
24. What injury must be considered as inevitable in persons buried beneath debris?.....
25. List 5 symptoms of abdominal injury.
(1)..... (2)..... (3).....
(4)..... (5).....
26. Give 6 steps in treatment of abdominal injuries.
(1)..... (2)..... (3).....
(4)..... (5)..... (6).....
27. List 3 don'ts in treatment of open wounds of abdomen.
(1)..... (2)..... (3).....
28. List the 6 priorities in treatment and transportation.
(1)..... (2)..... (3).....
(4)..... (5)..... (6).....

*Anatomic drawings were used to illustrate lecture.

PRACTICAL EXAMINATION

Examined by Remarks

1. Syringe
2. Venoclysis
3. Splints
4. Pressure Points

There are 18 steps to be followed to successfully give intravenous saline for shock. This one procedure will unquestionably save more lives in the event of an atomic explosion than almost any other treatment you will be called upon to use. Continual practice is necessary to become completely familiar with the mechanics and the application of this technic. List as many of the 18 steps in their correct order as you can.

(1)..... (11).....
(2)..... (12).....
(3)..... (13).....
(4)..... (14).....
(5)..... (15).....
(6)..... (16).....
(7)..... (17).....
(8)..... (18).....
(9)..... (a).....
(10)..... (b).....
(c).....

*Anatomic drawings were used to illustrate lectures.

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TAX EXEMPTION OF NONPROFIT OSTEOPATHIC HOSPITALS

All states encourage the establishment of charitable institutions, which perform a public service by relieving the state governments in part of the need to establish public facilities, by enacting laws which exempt from state taxes such charitable institutions. There are various types of charitable institutions but probably the most common is nonprofit hospitals. Such hospitals may be found in all states and are staffed, depending upon the particular hospital, by physicians of the various schools of medicine. Exemption from taxation at a state level may be granted not only to the real estate owned by nonprofit hospitals but also to unemployment insurance, personal property, sales, income, and other forms of taxation utilized by the various states to procure revenue for the state governments. Becauses exemption from taxation is a special privilege accorded by statute, courts uniformly give to laws granting tax exemption a strict legal construction. Exemption from taxation is in a sense the granting of a subsidy to such nonprofit corporations at the expense of the general taxpayers. Corporations operated for profit or where pecuniary gain accrues to any one or more persons are not eligible to receive tax exemption.

Hospitals throughout the United States staffed by doctors of osteopathy or on whose staffs doctors of ostepathy serve must conform to the general principles of law and legal requirements applicable to other nonprofit hospitals. Such hospitals must be operated as charitable institutions and there must be no dominant or substantial use which is to the pecuniary advantage of any persons or corporations. When litigation involving the tax exemption of a nonprofit hospital is before a court, the court will closely scrutinize and review the evidence to determine the manner and character of the business conducted by the nonprofit corporation. On a few occasions courts have denied to osteopathic hospitals tax exemption because of the presence in the articles of incorporation of provisions which might render the corporation susceptible to the private pecuniary advantage of one or more persons or where the facts of the case indicated that the hospital was not being conducted as a charitable institution. Generally speaking, nonprofit osteopathic hospitals have been granted the benefits of exemption from taxation without resort to litigation and therefore the only cases that have come to public attention are those in which some question was raised as to the charitable character of an osteopathic hospital. Since the general principles of law applicable to all nonprofit hospitals apply with equal effect to osteopathic hospitals the number of appellate legal decisions involving nonprofit osteopathic hospitals and their right to tax exemption are few. A recent decision (July, 1953) of the Supreme Court of Florida in *Orange County v. Orlando Osteopathic Hospital,* 66 So. 2d 285 (1953), however, involved a nonprofit osteopathic hospital and since the opinion discusses some of the more important legal issues involved in the subject of the exemption from taxation of nonprofit osteopathic hospitals, it is printed below in full. An understanding of this decision may assist other nonprofit osteopathic hospitals to accomplish their charitable purposes of contributing to the public health and welfare of the communities in which they are located.

In the decision set out below involving the Orlando Osteopathic Hospital the Supreme Court of Florida affirmed a decree of the trial court holding the hospital exempt from ad valorem taxes upon real property owned by the hospital. The hospital is a nonprofit corporation organized under the laws of Florida and its members are osteopathic physicians and surgeons licensed in the state. Its facilities are available for the use of all qualified osteopathic physicians and surgeons. Over an 8-year period preceding the trial of the case the nonprofit corporation was able to retain only 3.32% of its net revenue and during the same period an average of 34.19% of its revenue was devoted to charity patient treatment, not including outpatient charity for which no figures were available. Much of the charity care involved the expenses of patients who were unable to pay their hospital bills. In this regard the court noted and commended the policy of the hospital which did not require a patient to establish financial responsibility as a prerequisite to admission. No salaries were paid to any doctors, officers, directors or trustees, and only reasonable salaries were paid to nurses and clerical help. This hospital was well equipped and the record evidences that it was used frequently to assist in the training and instruction of young doctors and in the conduct of forums and seminars on osteopathic medicine and surgery for the benefit of osteopathic physicians and surgeons in central Florida. Biweekly meetings of the staff had been held for the purpose of discussing osteopathic clinical problems, peculiarities of particular cases, and new and improved methods of osteopathic care. The court recognized that hospital facilities, generally speaking, in Orange County have been overcrowded for a number of years and that the Orlando Osteopathic Hospital, therefore, contributed to the general welfare by helping to alleviate this situation. It was further recognized that were it not for the existence of this osteopathic hospital, patients desiring care from osteopathic physicians would have been denied the advantages of hospital facilities because they could not have received such treatment in other hospitals in the county for the reason that such other hospitals do not permit osteopathic physicians and surgeons to serve on their staffs. The court found that the hospital made reasonable charges for the care rendered patients able to pay and served without charge all patients seeking its services who were unable to pay. No patient was denied the use of the facilities or services of the hospital because of an inability to pay, and no distinction was made between the hospital care rendered those patients able to pay and those who were not.

The facts, therefore, involved in this case are typical of those applicable to most nonprofit hospitals throughout the country and the decision it is believed, therefore, will be of considerable interest to boards of trustees and administrative officials of osteopathic hospitals. The benefits accruing to a hospital from exemption from state taxation are considerable. It must always be recognized, however, that such benefits are granted to an institution because it is operated and administered primarily in the interest of making hospital facilities available to the general public.

ORANGE COUNTY ET AL v. ORLANDO OSTEOPATHIC HOSPITAL, INC.

Supreme Court of Florida
Special Division A.
July 17, 1953.

Suit by osteopathic hospital non-profit corporation for decree exempting plantiff's property from payment of ad valorem taxes on ground that such property was being used for educational, scientific and charitable purposes. The Circuit Court for Orange County, Frank A. Smith, J., entered a decree adverse to the defendants and they appealed. The Supreme Court, Sebring, J., held that evidence justified finding that property of plaintiffs was devoted to charitable purposes so as to be exempt under statute from payment of ad valorem taxes.

Decree affirmed.

TAXATION

1. Exemptions from taxation are granted by sovereign only when and to extent it may be deemed to conserve general welfare. F.S.A. § 192.06; F.S.A.Const. art. 9, § 1.

2. Organic and statutory exemptions from taxation, being in nature of special privileges or immunities, should be strictly construed in order to confine exemptions within limitations prescribed by sovereign power. F.S.A. § 192.06; F.S.A.Const. art. 9, § 1.

3. A charitable institution does not lose its charitable character and its consequent exemption from taxation merely because recipients of its benefits who are able to pay are required to do so, where funds so derived are devoted to charitable purposes of institution. F.S.A. § 192.06; F.S.A.Const. art. 9, § 1.

4. Evidence justified finding that property of osteopathic hospital non-profit corporation was devoted to charitable purposes so as to be exempt under statute from payment of ad valorem taxes. F.A.S. § 192.06; F.A.S.Const. art. 9, § 1.

Akerman, Dial & Akerman, Orlando, for appellants.

Baker & Thornal, Orlando, for appellee.

SEBRING, Justice.

The defendants below have appealed from an adverse ruling in a suit brought by the plaintiff to obtain a decree exempting its property from the payment of ad valorem taxes, on the ground that the property is being used for educational, scientific and charitable purposes.

The case below was tried on a complaint, an answer, and a stipulation as to the relevant facts. From these pleadings and stipulations the following appears:

Orlando Osteopathic Hospital is a non-profit corporation organized under the laws of Florida. It has no stockholders. Its members are osteopathic physicians and surgeons, and its facilities are available for the use of all qualified osteopathic physicians and surgeons. The charter of the corporation requires it "to use and expend all surplus moneys and funds only for the purpose of improving, enlarging and increasing the said hospital and hospital equipment."

No profits from the operation of the hospital are turned back to the members. Whenever any surplus income accrues, it is used to purchase additional facilities and equipment and in the expansion of hospital services. For an 8-year period covering the years 1944 to 1951, inclusive, the corporation was able to retain only 3.32% of its net revenue, and during the same period an average of 34.19% of its net revenue was devoted to charity patient treatment, not including out-patient charity for which no figures were available but which was substantial.

The corporation does not pay salaries to the doctors, officers, directors or trustees of the institution. Reasonable salaries are paid to nurses and clerical help. The property is used strictly and solely for hospital purposes. In the hospital is a well-equipped laboratory and modern, efficient diagnostic X-ray equipment.

Throughout the period of its existence, the hospital facilities have been used for training young doctors and interns in the science of osteopathic medicine and surgery. Frequent forums, seminars and meetings of central Florida osteopathic physicians and surgeons are held in the hospital for the purpose of discussing osteopathic medical problems and peculiarities of particular cases and new and improved methods of osteopathic treatment. Bi-weekly meetings of the staff of the hospital are held for the same purpose, and these meetings include the nurses, who are given the benefit of discussions and papers presented.

Hospital facilities, generally, in Orange County, have been overcrowded for a number of years and have been unable to meet the patient demand. As its contribution toward relieving this condition, the plaintiff, for the period from 1944 to 1949, inclusive, cared for 3807 patients, or, on the average, 635 patients a year, exclusive of patients cared for in the out-patient department. Except for this contribution, patients desiring treatment by osteopathic physicians and surgeons in the area would have been denied the advantages of hospital facilities, because they could not have obtained such treatment in the other hospitals in the county for the reason that the other hospitals do not permit osteopathic physicians and surgeons to use their facilities.

The hospital makes reasonable charges to patients who are able to pay and serves without charge all patients seeking its services who are unable to pay. No patient is denied the use of the facilities or services of the hospital becauses of inability to pay, and in the services rendered and the use of the accommodations provided, no distinction is made between those patients who are able to pay and those who are not.

Since its incorporation the corporation has been exempted from the payment of federal income taxes becauses of its being a corporation organized and operating exclusively for charitable purposes. The comptroller of the State of Florida has ruled that the corporation is exempt from the payment of sales taxes on its purchase because it is a charitable, educational and scientific corporation.

The question is whether the decree of the trial court holding the corporation to be exempt from the payment of county ad valorem taxes is supported by the record.

Section 1, Article IX, of the Florida Constitution, F.S.A., provides that "The Legislature shall provide for a uniform and equal rate of taxation . . . excepting such property as may be exempted by law for municipal, education, literary, scientific, religious or charitable purposes." Pursuant to this constitutional provision, the Legislature enacted section 192.06, Florida Statutes 1951, F.S.A., which provided, in part as follows:

"The following property shall be exempt from taxation: . . . Such property of education, literary, benevolent, fraternal, charitable and scientific institutions within this state as shall be actually occupied and used by them for the purpose for which they have been or may be organized; provided, not more than seventy-five per cent of the floor space of said building or property is rented and the rents, issues and profits of said property are used for the educational, literary, benevolent, fraternal or charitable purposes of said institution; provided, further, that nothing in this subsection shall be construed as applying to special assessment by municipalities for sidewalks, curbing, street paving or other local improvements."

[1, 2] It is settled in this jurisdiction that "Exemptions from taxation are granted by the sovereign only when and to the extent that it may be deemed to conserve the general welfare. Organic and statutory exemptions, being in the nature of special privileges or immunities, should be strictly construed in order to confine the exemptions within the limitations prescribed by the sovereign power; otherwise the law-making intent and purpose may be frustrated to the detriment of the public welfare." Lummus v. Florida-Adirondack School, 123 Fla. 810, 168, So. 232, 237. "But this does not mean that where an exemption is claimed in good faith the provision of law under which the claimant attempts to bring himself is to be subjected to such a strained and unnatural construction as to defeat the plain and evident intendments of the provision." Lummus v. Cushman, Fla., 41 So.2d 895, 897.

In the instant case the trial judge recognized the principles that must govern in the determination whether or not the institution involved should be exempted from the payment of taxes, and made a very clear and comprehensive analysis of the controlling evidence on the issue.

From his findings, it appears that "there is but very little educational use of the property, so that it is essential that a determination be made whether the use is scientific or charitable within the usual meaning of those terms in connection with the operation of a hospital."

As to the issue whether the property was being actually occupied and used by the corporation for scientific or charitable purposes, the trial judge found: "A hospital is charitable or not depending on how it is operated. . . . The one in question partakes more of a private nature, but we must examine the plan of operation to decide whether it was public and charitable. . . .

"The charter merely says that it shall be a non-profit hospital where charity and other patients may be treated. The stipulation shows that plaintiff make reasonable charges to patients who are able to pay . . . all surplus income over expenses is converted into the purchase of additional facilities and equipment and in expanding hospital services. . . .

"If the object for which an institution is founded is the general public good, and not private gain, and it is so conducted that the public receives all the benefits of it, it is purely a public charity. It is shown that much of the services listed by the hospital for charity was for patients not admitted as charity patients but after services were rendered the hospital found itself unable to collect. If these were unable to pay, I believe they may be classed as charity patients although they were not admitted as such. A policy of not requiring a showing of financial responsibility before receiving a patient is to be commended.

"I don't consider that the charter shows that plaintiff was organized as a purely charitable institution—it was, according to its expressed purpose, for charity and other patients, yet if in fact the property was used exclusively for educational, scientific or charitable purposes it would be entitled to exemption.

"According to . . . the Chairman of the Board . . . all surplus derived from the hospital since its inception has been used for improvements and for the purchase of necessary equipment to improve the hospital facilities.

"The Hospital has a schedule of amounts of deposits for the various types of cases to be treated and when a patient applies he is required to pay the specified amount if he is able or if he is able to pay only a part nevertheless he is received and treated and the hospital accepts the amount he is able to pay. If a patient applies who is unable to pay nevertheless he is accepted and accorded the same treatment and attention as those who do pay. So far as hospital services are concerned, no distinction is made between those patients who are able to pay all or a part of their bill and those who are not able to pay at all."

From these findings the trial judge concluded that the hospital, as operated, came within the provisions of section 1, Article IX, of the Constitution, and section 192.06, Florida Statutes 1951, F.S.A., and granted the exemption.

We find no error in this ruling.

[3, 4] From the facts in the case it is shown that no person or corporation receives profit from the use of the property except the members of the public who apply for its use. Through the facilities of the institution, the corporation offers a type of care and treatment not available in other hospitals in the area. That there is present a substantial charitable use is beyond question. Patients who are unable to pay are received for treatment and receive the same care and attention as those who are able to pay. As to the patients who are able to pay, the evidence is plain that profits received from treatment of such patients go back into the expansion of facilities and services. "A charitable institution does not lose its charitable character and its consequent exemption from taxation merely because recipients of its benefits who are able to pay are required to do so, where funds derived in this manner are devoted to the charitable purposes of the institution." Miami Battlecreek v. Lummus, 140 Fla. 718, 192 So. 211, 218; Lutheran Hospital Ass'n v. Baker, 40 S.D. 226, 167, N.W. 148; Board of Com'rs of Tulsa County v. Sisters of the Sorrowful Mother, 141 Okl. 32, 283 P. 894; anno. 34 A.L.R. at 637, 62 A.L.R. at 330, and 108 A.L.R. at 286.

We conclude from the facts in the case that aside from any issue as to the use of the institution for educational or scientific purposes, the property was devoted to charitable purposes, within the purview of the controlling law, and hence that the decree appealed from should be affirmed.

It is so ordered.

ROBERTS, C. J., and TERRELL, J., and DAYTON, Associate Justice, concur.

Department of Public Relations

CHESTER D. SWOPE, D.O.
Chairman
Washington, D.C.

MURRAY GOLDSTEIN, D.O., IN PUBLIC HEALTH SERVICE

Murray Goldstein, D.O., was commissioned as Senior Assistant Surgeon in the Public Health Service, and assigned to active duty at the National Institutes of Health on November 2, 1953.

Several osteopathic physicians served as assistant scientists, formerly sanitarians, in the Public Health Service during World War II.

Dr. Goldstein is the first osteopathic appointee to serve as a commissioned medical officer.

HEALTH OFFICERS CONFERENCE

The fifty-second Conference of State and Territorial Health Officers with the Surgeon General of the Public Health Service, and the Chief of the Children's Bureau, was held in Washington, November 4-7. A. G. Reed, D.O., member of the Oklahoma State Board of Health, was one of the designates of the Oklahoma Commissioner of Health attending the conference. Some of the more pertinent actions taken by the Conference were as follows:

1. That the split project technic of approving hospital projects utilized since the start of the Hill-Burton program be continued and that no additional administrative policies be promulgated that will result in an added financial burden to sponsors or that will delay the start and completion of urgently needed hospital facilities.

2. That there should be no further reduction in the federal grants for health to States until the Commission on Inter-Governmental Relations has submitted its report and recommendations to Congress. Any changes in grants at that time should permit a period of adjustment to enable the State health departments to present budgets to their legislatures, many of which meet only every 2 years.

3. That uniform and effective methods of physical examination and laboratory studies be applied in screening applicants for admission into the United States and that sufficient funds be made available to permit adequate implementation of this program.

4. That the U. S. Public Health Service be encouraged to extend its field refresher courses to cover subjects in bacteriology, mycology, parasitology and to extend courses now available; said courses to be given with cooperation of existing laboratories and to be open to all qualified laboratory personnel in each State.

5. That opportunities be provided by state and territorial health departments for the training of their own staff physicians dealing with children and for the training of physicians in practice dealing with children in order that up-to-date information be acquired on child development so that nation-wide recognition be given this area of knowledge as a public health concern.

HEALTH INQUIRY

A special committee of the House Committee on Interstate and Foreign Commerce left early in November for Europe to make a first-hand study of European health and hospital programs. The special committee consists of Chairman Wolverton, of New Jersey, and Messrs. Hoffman and Springer, of Illinois. During the first 2 weeks in October the full Committee on Interstate and Foreign Commerce held hearings on the principal diseases of mankind. These hearings were suspended on October 14 until after the beginning of the second session of Eighty-Third Congress in January.

BERRY TO SUCCEED CASBERG

Dr. Melvin Casberg, the incumbent Assistant Secretary of Defense (Health and Medical) is resigning, effective the first of January. Dr. Frank Brown Berry, Brigadier General (Rtd.), is slated as his successor. Berry is a Professor of Surgery at Columbia, member of the Board of Governors of the American College of Surgeons, and long-time consultant to Army Surgeons General.

Book Notices

CORNELL CONFERENCES ON THERAPY. Edited by Harry Gold, M.D. Cloth. Pp. 287. Price $4.00. The Macmillan Company, 60 Fifth Avenue, New York 11, 1953.

Inaugurated in 1937, the Cornell Conferences on Therapy, arranged for the participation of every department of the Cornell University Medical College-New York Hospital and the collaboration of other institutions, have been held weekly throughout the larger part of the school year. In recent years the best reports have been selected for book publication; the series is now in its sixth volume; and to date, ninety-one conferences have been published.

The choice of subjects is made to insure emphasis on both new discoveries and basic principles. During discussion the various aspects of the subject are explored; evidence on controversial points of opinion and practice is analyzed; and the physiologic, pharmacologic, and chemical bases of therapeutic measures are elaborated upon. Editing is aimed at clarity of text, and concise formulation of questions and direct answers.

This volume should be of special interest to osteopathic physicians as the first five chapters contain discussions on the therapy of the blood, the heart, and the circulatory systems. Up-to-date material on the use of antibiotic combinations, medical treatment of peptic ulcer, treatment of the patient in coma, and treatment of burns is included. The volume constitutes a rich source of authoritative information on practical therapeutics.

STRESS AND DISEASE. By Harold G. Wolff, M.D., Professor of Medicine (Neurology), Cornell University Medical College; Attending Physician, New York Hospital, New York, New York. Cloth. Pp. 199, with charts and figures. Price $5.50. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1953.

"Stress and Disease," publication Number 166 in the American Lecture Series, is a contribution toward the study of the nature of disease in man. Its 151 pages, excluding a valuable bibliography of eighteen pages and author and subject indexes, is a study of the nature of stress as a causal agent in disease. The word "stress" as applied to biologic science is used with the connotation employed in mechanics in which stress "is the internal or resisting force brought into action in parts by external forces or loads." In biology "load" becomes the stimulus or the external environmental agent. If the stress entails alteration or deformation in the organism the changes produced are termed "strain."

The author accepts Claud Bernard's concept that disease results when the body fails to maintain a normal state of

homeostasis, because of inability to make an adequate adaptive response to noxious forces, or because the adaptive response in itself may be destructive in nature. The author's generalization about the nature of disease in man carries him a step further. He grants man's vulnerability to the *direct* effects of climate, micro-organisms, terrain, and physical forces in disease. But he points out that strain within man can arise from the impact of man on man. Disruption of customs and habits and deprivation of basic human needs and of opportunities to fulfill human potentialities all are important stresses which are productive of strain. Stress, therefore, is a factor of vast biologic significance because of the bodily changes which it can entail. The 97 pages of Chapter II are given over to a presentation of the experimentally observed effects of stress in man.

The student of the osteopathic concept will find in this stimulating essay much material that will confirm osteopathic emphasis upon body unity. He will also find in the text and the accompanying bibliography material for the development and enlargement of the concept. As such, the monograph is an important contribution toward an understanding of one phase of the disease process.

Modern Medical Monographs: GOUT AND GOUTY ARTHRITIS. By John H. Talbott, M.D., Professor of Medicine, The University of Buffalo School of Medicine; Physician-in-Chief, Buffalo General Hospital, Buffalo, New York. Cloth. Pp. 92, with illustrations. Price $4.00. Grune & Stratton, Inc., Medical Publishers, 381 Fourth Ave., New York 16, 1953.

In the 10 years since previous efforts by the author to assemble a comprehensive treatise on gout, many advances have been recorded which further the understanding of the metabolic dyscrosia. Dr. Talbott has attempted to document in this small book, a Modern Medical Monograph, advances in its understanding with emphasis on those phases which are of interest to the general practitioner who continues to confuse the differentiation between gout and gouty arthritis, both in diagnosis and treatment.

Studies during the past few years which have utilized isotope technics have identified some of the precursors of uric acid and have removed some of the stigma from proteins. Recent observations in the laboratory suggest that proteins may be no worse offenders as precursors of uric acid than carbohydrates and fats. Talbott believes a moderate protein intake is permissible, but a high fat diet should be avoided. There are other discussions of new developments in the treatment, particularly with drug therapy. About one-third of the monograph deals with treatment.

An extensive bibliography and an index add to the usefulness of the book. Being small, it is a well-planned reference. Most physicians will find it an adequate source of information on the subject.

FUNCTIONAL DISORDERS OF THE FOOT. Diagnosis and Treatment. By Frank D. Dickson, M.D., F.A.C.S., Clinical Professor of Surgery, University of Kansas School of Medicine; Orthopedic Surgeon, St. Luke's, Kansas City General, and Wheatley Hospitals, Kansas City, Missouri, and Providence Hospital, Kansas City, Kansas; and Rex L. Diveley, A.B., M.D., F.A.C.S., Assistant Professor of Orthopedic Surgery, University of Kansas School of Medicine; Chief Orthopedic Consultant, Veterans Administration, Washington, D. C.; Chief Orthopedic Surgeon, Kansas City General Hospital; Orthopedic Surgeon, St. Luke's and Wheatley Hospitals, Kansas City, Missouri, and Providence Hospital, Kansas City, Kansas. Ed. 3. Cloth. Pp. 345, with illustrations. Price $6.75. J. B. Lippincott Co., E. Washington Sq., Philadelphia 5, 1953.

Foot imbalance is a problem of great sociologic and economic importance and should be of deep interest to all practicing physicians. However, few outside the orthopedic specialty have any understanding of common disorders of the foot with respect to symptomatology, diagnosis, and treatment. This, the third edition of "Functional Disorders of the Foot," is designed to present a practical statement of the causes and symptoms of disabling foot conditions and to suggest therapeutic measures of value in correcting pathology or relieving symptoms. Recent material has been added on architectural defects of the bones of the foot and on surgical procedures for correction of flatfoot, hallux valgus, intractable plantar warts, and deformity of the nails. New illustrations to clarify the text are also included. Osteopathic physicians will agree with the new emphasis on proper foot balance and will find this an adequate source for treatment of common foot disorders.

RHEUMATIC FEVER. A Symposium Held at the University of Minnesota on November 29, 30 and December 1, 1951, under the Sponsorship of the Minnesota Heart Association. Edited by Lewis Thomas, M.D. Cloth. Pp. 349. Price $10.00. University of Minnesota Press, Minneapolis 14, 1952.

Generally accepted as a children's disease, rheumatic fever as seen through research is one of the most baffling and complex of all medical problems. Its true significance as a menace to health in early life is not yet fully appreciated by many physicians, nor do investigators and practitioners in the field know or agree on many of its aspects. To evaluate objectively the present status of knowledge of rheumatic fever and to define clearly the problems yet to be solved, a 3-day symposium on the subject was held at the University of Minnesota from November 29 through December 1, 1951. Twenty-three papers which were originally given at the conference representing the work of more than forty experts in the field have been published in book form in order that the medical profession may read and digest the findings, be conversant with the subject, and utilize discoveries of real value. The papers examine rheumatic fever from the standpoint of its natural history, epidemiology, pathology, the role of the hemolytic streptococcus as an etiologic agent, its biochemical and serologic aspects, and its therapy.

Some of the points which are agreed upon are: A streptococcal infection plays an important role in the etiology of the disease, arthritis commonly appears, Sydenham's chorea occurs as a manifestation, and profound chemical changes take place in the connective tissue. Whereas there are definite steps to be taken in the prevention of recrudescences of rheumatic manifestations, exact treatment is still in the experimental stage. The book includes extensive bibliographies for each chapter.

NUTRITION IN HEALTH AND DISEASE. By Lenna F. Cooper, B.S., M.A., M.H.E., Sc.D., Consulting Dietitian and Formerly Chief of the Department of Nutrition, Montefiore Hospital, New York City; Formerly Food Director, University of Michigan, Dean of School of Home Economics, Battle Creek College; and Supervising Dietitian, U. S. Army, World War I; President, American Dietetic Association, 1937-1938, Edith M. Barber, B.S., M.S., Writer and Consultant, Food and Nutrition; Food Editor, General Features Syndicate; Formerly Food Editor, New York Sun; and Lecturer on History of Cookery and Public Relations for Home Economics, Teachers College, Columbia University, Helen S. Mitchell, A.B., Ph.D., Dean of the School of Home Economics, University of Massachusetts; Formerly Research Professor of Nutrition, University of Massachusetts; Principal Nutritionist, Office of Defense, Health and Welfare Services; and Professor of Physiology and Nutrition, Battle Creek College, and Henderika J. Rynbergen, B.S., M.S., Associate Professor of Science, Cornell University-New York Hospital School of Nursing; Formerly Director of Dietetics, American University Hospital, Beirut, Lebanon; Food Clinic Dietitian, Vanderbilt Clinic, Presbyterian Hospital, New York; Food Clinic Dietitian, Barnes Hospital, St. Louis; and Nutritionist, Community Health Association, Boston. Cloth. Pp. 790, with illustrations. J. B. Lippincott Co., East Washington Square, Philadelphia 5, 1953.

In spite of the fact that nutrition did not emerge as a distinct science until the present century, already its value in health and disease has been established as an important facet in the field of medicine. Research methods and scientific tools have kept the science apace with the rapidly changing concepts in related fields. Written jointly by established nutritionists and dietitians this, the 12th edition, has the stamp of authoritativeness without losing its feel for the practical. Primarily a textbook for nurses, it is an excellent source book for the professional worker as well as the layman. It has been completely revised, reset, and brought up to date to provide an exhaustive coverage of the subject. New introductory material has been designed to give a picture of world usage and the relative importance of the different classes of foods. Organized under

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